Arithmetic We Need

CURRICULUM

6

BUSWELL
BROWNELL
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MAEDEL

W. E. Hodgson

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GRADE 6

Arithmetic We Need

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Contents

CHAPTER PAGE

1 Maintaining Understandings and Skills: Numbers and Number System; Roman Numerals; Addition, Subtraction and Multiplication with Whole Numbers; Estimating with Whole Numbers · Problem-Solving 1

2 Maintaining Understandings and Skills: Division of Whole Numbers; Measures Including Operations with Denominate Numbers · Finding Perimeter and Area · Problem-Solving 44

3 Maintaining and Extending Understandings and Skills: Meaning, Addition and Subtraction of Fractions and Mixed Numbers; Comparing Fractions · Rounding and Estimating with Fractions · Problem-Solving 96

4 Understanding Multiplication with Fractions and Mixed Numbers · Cancellation · Rounding and Estimating with Mixed Numbers · Scale Drawing · Picture Graphs and Bar Graphs · Problem-Solving 130

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CHAPTER PAGE

5 Understanding Division with Fractions and Mixed Numbers • Meaning of Ratio • Line Graphs • Problem-Solving, Including Three Kinds of Problems with Fractions 174

6 Understanding Decimals through Millionths • Addition, Subtraction, Multiplication with Decimals • Rounding and Comparing Decimals • Problem-Solving 216

7 Division with Decimals • Changing a Common Fraction to a Decimal • Short Division • Problem-Solving Including Three Kinds of Problems with Decimals 254

A., S., M., D. Facts and Extra Practice (Sets 1–127) 291

Tables of Measure 327

Index 328

565010

1

Higher and Faster!

Reading numbers for meaning [O]

The picture shows a piloted rocket plane that can travel 1,238 miles an hour. It has reached an altitude of 79,494 feet. The guided rocket has gone as high as 1,320,000 feet.

These are days of big numbers. That makes it important for us to be able to read any number quickly and to understand the meaning of each of the figures that make it up.

1. The numbers in the paragraph about rockets are repeated in box A. Read each number. Think about place values if you need to.

2. The 1-place number 3 means this many: •˙• On the board, show the meaning of 4; of 5; of 7.

A

Place value	Hundred million	Ten million	Million	Hundred thousand	Ten thousand	Thousand	Hundred	Ten	One
Number						1,	2	3	8
					7	9,	4	9	4
			1,	3	2	0,	0	0	0

3. The number 48 means forty-eight of anything. This 2-place number is built up by multiplying and adding, as shown in box B.

B

= 48

This is the multiplying.
The 4 of 48 means 4 tens, or 4 × 10, or 40
The 8 of 48 means 8 ones, or 8 × 1, or 8
48
This is the adding.

4. Explain the meaning of the 3-place number 572, in box C.

C

This is the multiplying.
The 5 of 572 means 5 hundreds, or 5 × 100, or _?_
The 7 of 572 means 7 tens, or 7 × 10, or _?_
The 2 of 572 means 2 ones, or 2 × 1, or _?_
_?_
This is the adding.

5. Using box A to help you, write at the board the meaning of the 4-place number 1,238; of the 5-place number 79,494; of the 7-place number 1,320,000.

Taking Numbers Apart in Several Ways

[O]

We may show the meaning of a number of two or more places by taking it apart figure by figure.

1. $56 = 5$ tens and 6 ones, or $5 \times 10 + 6 \times 1$, or $50 + 6$. Is this 2-place number the sum of two products? Explain.

2. On the board, show the meaning of 38; of 46; of 25.

3. $732 = 7 \times 100 + 3 \times 10 + 2 \times 1$, or $700 + 30 + 2$. This 3-place number is the sum of how many products?

4. On the board, show the meaning of 486; of 594.

5. $8{,}427 = 8 \times 1{,}000 + 4 \times 100 + 2 \times 10 + 7 \times 1$, or $? + ? + ? + ?$ This is the sum of how many products?

6. In the same way, tell the meaning of 3,426; of 7,694.

7. See if you can tell the meaning of these larger numbers:
a. 38,742 b. 209,654 c. 1,024,691 d. 30,976,507

A whole number is the sum of the products shown by its figures.

There are also other ways of taking a number apart to show its meaning. In the work below, two or more figures are used together to show new meanings.

57,126 = 57 thousands and 1 hundred and 2 tens and 6 ones,
or = 571 hundreds and 2 tens and 6 ones,
or = 571 hundreds and 26 ones,
or = 5,712 tens and 6 ones

8. On the board show that each row in the box equals 57,126.

[W]

Write in three different ways the meaning of
9. 47,632. 10. 853,297. 11. 64,927,050. 12. 3,401,762.

13. For each number below, write what "6" means:
a. 128,604 b. 6,715,000 c. 596,287

Billions of Things

Reading and writing billions [O]

Nobody knows how many stars there are, but people who study about them think that there are many billions.

Look at Ex. a to c in the box. In reading the number in Ex. a, we first say the number of billions, then the number of millions, and so on, this way: "5 billion, 837 million, 643 thousand, 842." Why do we not say, "842 ones"?

1. Read Ex. b and c, thinking the place values and the period values in the box if you need to.

Value of Place	Hundred billion	Ten billion	Billion	Hundred million	Ten million	Million	Hundred thousand	Ten thousand	Thousand	Hundred	Ten	One
a.			5,	8	3	7,	6	4	3,	8	4	2
b.		2	0,	6	4	7,	1	6	4,	9	1	4
c.	2	5	9,	1	0	5,	1	7	8,	7	8	5
Value of Period	Billion			Million			Thousand			One		

2. For Ex. c, tell the place value of each figure.

Read each of the following statements:

3. The cars made one year were valued at $8,729,000,000.

4. The amount of motor fuel supplied was 998,093,000 barrels.

5. The number of eggs produced one year was 60,046,000,000.

[W]

Write in figures the numbers in these statements:

6. There are about 140 billion units of gas available.

7. It has been estimated that the fifteen billion barrels of oil in that section alone are worth $40 billion.

8. The expenses totaled more than ten billion dollars.

Using Round Numbers

[O]

a	b	c	d	e
20	140	7,400	18,000	5,000,000
21	141	7,410	18,100	→5,100,000
22	142	7,420	18,200	5,200,000
→23	143	7,430	18,300	5,300,000
24	144	7,440	18,400	5,400,000
→25	→145	7,450	18,500	5,500,000
26	146	7,460	18,600	5,600,000
27	147	7,470	18,700	5,700,000
28	148	→7,480	→18,800	5,800,000
29	149	7,490	18,900	5,900,000
30	150	7,500	19,000	6,000,000

1. For many purposes, we use round numbers instead of exact numbers. In column a, is 23 nearer to 2 tens or 3 tens? To the nearest ten, we round 23 to 2 tens, or _?_.

2. In column a, 25 is halfway between 2 tens and 3 tens. When a number is just halfway, we generally round it to the next higher ten, so 25 rounded to tens is 30. In column b, will 145 be rounded to 140 or to 150?

3. To round 7,486 to the nearest hundred, look at column c and think where 7,486 would come. Would you round it to 7,400 or to 7,500? Why do you not need to think about the ones?

4. Tell from column d why 18,897, to the nearest thousand, would be rounded to 19,000. In rounding to the nearest thousand, why do you not need to think about the tens or the ones?

5. Rounded to the nearest million, 5,123,746 (column e) becomes _?_. Why?

[W]

6. Round to the nearest million: **a.** 1,141,615,000 acres; **b.** 96,836,075 T.; **c.** 1,465,134,000 bu.; **d.** 26,567,374 children.

How the Romans Wrote Numbers

[O]

Our system of writing numbers is called Arabic notation. This system uses the idea of *place value;* that is, the value of a figure depends on its place in a number.

Roman notation does not have place value. Each of the seven number-letters in the Roman system always has the value shown in the box. To make other numbers, values are added.

I	1
V	5
X	10
L	50
C	100
D	500
M	1,000

The Roman system also has six subtracting numbers. These are pairs of letters in which the values are subtracted. For example, IV means 5 − 1, or 4. In reading and writing Roman numbers, we use such a pair as a single number and add its value to the values of the other letters.

1. The six subtracting numbers are IV, IX, XL, XC, CD, and CM. Explain the meaning of each of these pairs.

2. In reading the number MCMLXXIV, first see the subtracting pairs CM and _?_. Then add values. MCMLXXIV means 1,000 + 900 + _?_ + _?_ + 10 + _?_, or _?_.

3. To write 429 in Roman numerals, first *think*, "This number means 400 + 20 + 9, so I must use the subtracting pairs _?_ for 400 and _?_ for 9." Then the number is _?_.

[W]

Write these in Arabic notation:

	a	b	c	d	e	f
4.	XVII	XXXIV	XIX	LVIII	CXI	XCV
5.	DCX	MDC	MM	MCDL	MCM	MCMLIV

Write these in Roman notation:

6.	36	44	19	27	63	48
7.	150	274	610	1,368	1,456	1,948

8. List ways in which we use Roman numbers.

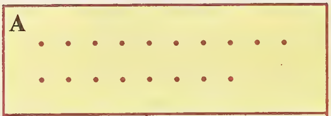
Thinking about Whole Numbers

[W]

1. For the dots in box A, write the Arabic number; the Roman numeral.

2. In box B, number a is how many times number b?

3. Copy the number in box C which you can round to 5 million.

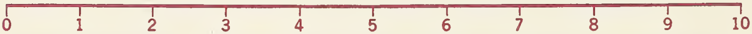


B	C
a. 3,600	470,000
b. 36	4,670,000
	47,281,000

The numbers 2, 4, 6, and 8 and all numbers ending in 2, 4, 6, 8, or 0 can be divided evenly by 2. They are called even numbers. Numbers that are not even are called odd numbers.

4. From the following, write the even numbers in a column headed "even" and the odd numbers in a column headed "odd."
11 62 48 97 260 509 7,124 6,258 12,485

5. Numbers may be represented by distances on a number line like the one below. Copy this number line and below it draw a dotted line to show the distance for the number 7.



6. Copy the numbers in Ex. a below, putting in the number that belongs where you see n. Do the same for Ex. b to f.

a. 2, 4, n, 8 **b.** 5, n, 15, 20 **c.** n, 7, 9, 11
d. 80, 60, 40, n **e.** 26, n, 20, 17 **f.** 15, 24, n, 42

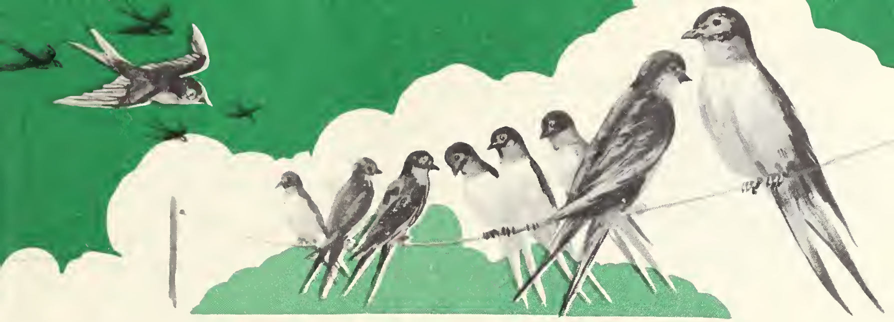
7. Write the smallest number you can round to 7,000,000.

8. Write the number which is 1 less than 1 billion.

9. Using only the figures 1, 2, and 3 each once, write the largest possible whole number; then the smallest.

10. What number is 10 more than 482? than 391? than 990?

11. How many 1,000's of people are there in a population of 160,000,000? of 13,845,000? of 6,470,000?



When We Add

Inventory Test 1 [W]

1. When all the birds shown in the picture above are together on the wire, how many birds will be there?

2. Miss Pike put 6 history books, 9 spelling books, 8 geographies, and 7 arithmetics on the table. How many books did she put on the table in all?

3. 16 cows, 3 horses, and 1 dog are how many animals?

4. Class committees sold 25 tickets, 9 tickets, 6 tickets, and 8 tickets. How many in all were sold by the committees?

5. Jack brought 18¢ for the record fund, Sue brought 9¢, Bill 6¢, and Jean 8¢. How much did all four pupils bring?

Helps for adding; meaning [O]

6. How many groups are put together in Ex. 1? in Ex. 2? in Ex. 3? in Ex. 4? in Ex. 5?

7. In which problems are the things in the groups exactly the same kind? In which are the things alike only in some ways?

Putting together like-groups, to find how many in all, is adding. Only like-things can be added.

a.
$$\begin{array}{r} 15 \\ +\ 2 \\ \hline 17 \end{array} \begin{array}{l} \left.\vphantom{\begin{array}{r}1\\1\end{array}}\right\} \textit{addends} \\ \textit{sum} \end{array}$$

b. $15 + 2 = 17$

Both Ex. a and Ex. b are read "15 plus 2 is 17" or "15 and 2 are 17."

8. For Ex. b tell the addends; the sum.

Addition (A.) Facts and Families

Helpers [O]

1. The 81 basic addition facts are given on page 291. Turn to that page, cover the answers, and say the facts. Make study cards for facts that you do not know.

2. Make a rule for addition when zero is in an addend; when 1 is an addend.

3. How can you use doubles to help you find the sums for near doubles (facts that are on either side of the doubles)?

4. For an example like 9 + 6, whose sum is a teen number, explain how to find the sum by first making a 10.

5. What helper can you use for a fact which is the reverse of a fact that you know?

Each basic A. fact gives its name to a family of examples in which a 1-place number and a 2-place number are added. If you know the fact, you can say all the sums in its family.

6. Two examples in the 7 + 2 addition family are 47 + 2 and 7 + 22. Give two more examples in this family.

7. Give three examples in the 6 + 7 family.

8. In examples like 56 + 2 and 3 + 24, the ten's figure in the sum is the same as the ten's figure in the 2-place addend. Explain.

9. In examples like 58 + 3 and 9 + 35, the ten's figure in the sum is how much larger than the ten's figure in the 2-place addend? Explain.

[W]

Write just the sums for these:

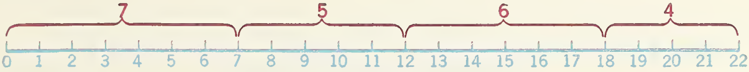
	a	b	c	d	e
10.	84 + 3	6 + 34	49 + 9	68 + 4	21 + 8
11.	66 + 7	77 + 2	8 + 39	45 + 6	2 + 49
12.	8 + 45	9 + 88	75 + 7	4 + 15	38 + 7

Helps in Column Addition

1-place addends [O]

1. This house has 7 windows on the north side, 5 on the east, 6 on the south, and 4 on the west. How many windows are there in all?

On the board, make a number line and count off 7, 5, 6, and 4 in that order (see below). On the number line, the sum of $7 + 5 + 6 + 4 = ?$



2. On the board, make a number line and find the sum of $5 + 6 + 4 + 7$. Make another number line and find the sum of $6 + 4 + 7 + 5$. Why is the sum 22 each time?

We may add groups or numbers in any order.

Usually we add downward, as in the box. Look at 7 and 5 and *think*, "12." With 12 in mind, look at 6 and *think*, "18." With 18 in mind, look at 4 and *think*, "22." So we *think*, "12, 18, 22."

If you add downward, then check by adding upward. *Think*, "10, 15, 22."

Add downward

$$\begin{array}{r} 7 \\ 5 \\ 6 \\ +4 \\ \hline 22 \end{array}$$

Check

[W]

Find the sums. Check your work.

	a	b	c	d	e	f	g	h	i
3.	4	7	2	6	8	3	4	9	8
	9	8	9	5	4	8	9	2	1
	7	6	9	8	6	8	5	7	4
	+2	+5	+7	+4	+9	+7	7	6	9
							6	4	8
							+7	+6	+4

Addition on the Farm

Inventory Test 2 [W]

If you can find these sums quickly and correctly, you should be able to add whole numbers wherever you find them.

1. For each year listed, find Mr. Hall's total number of acres.
1910: 92 acres of grazing land and 29 acres of crop land.
1930: 93 acres of grazing land and 37 acres of crop land.
1950: 99 acres of grazing land and 40 acres of crop land.

2. Find for each year his total number of bushels of grain.
1910: 94 bushels of wheat and 74 bushels of corn.
1930: 143 bushels of wheat and 79 bushels of corn.
1950: 294 bushels of wheat and 149 bushels of corn.

3. In different years, Mr. Jackson bought for his farm a new tractor for $2,700, a potato harvester for $4,865, and a baler costing $2,299. This machinery cost how much in all?

4. What did Mr. Jackson's neighbor, Mr. Chalmers, spend in all for a sugar-beet harvester costing $5,700, a corn picker costing $840, and a grain combine costing $5,075?

5. Find the total cost of the farm machinery purchased by Mr. Jackson and Mr. Chalmers.

6. In three months, Mr. Hill's hens produced 4,926 eggs, 5,405 eggs, and 8,264 eggs. How many eggs in all was that?

Adding Larger Numbers

Without and with carrying [O]

A	B
30 and 1 +20 and 6 50 and 7, or 57	Short way 31 +26 57

1. 31 + 26 = ? In box A we break 31 and 26 into two parts (tens and ones) and add ones to ones and tens to tens. When we add the sums of the parts, 50 and 7, the final sum is _?_.

2. Explain why in box B the short way of adding is also adding by parts. Which part do we add first?

C

	Thousands	Hundreds	Tens	Ones
	5,	1	2	4
		5	3	0
+	8,	2	1	3
1	3,	8	6	7

D

	Thousands	Hundreds	Tens	Ones
	1	2	1	
	3,	2	9	5
		6	8	4
+		5	6	8
	4,	5	4	7

3. Tell how we add by parts in box C.

4. In box D, the sum of the ones is _?_. Why must we carry 1 ten to ten's column? 2 hundreds to hundred's column? 1 thousand to thousand's column? Explain all the adding in box D.

[W]

Write sums on folded paper. Check by adding upward.

	a	b	c	d	e	f
5.	64 +32	26 +81	$4.61 +3.25	306 +82	$24.71 +2.81	3,076 +2,813
6.	28 66 +13	48 56 64 +18	$2.97 0.48 +7.06	309 508 605 +208	$53.82 63.95 +72.84	3,418 629 5,085 +7,697

➤ **Extra Practice.** For extra practice in addition, turn to pages 295 and 296 and work Sets 1–8.

When We Subtract

Inventory Test 3 [W]

1. Tom Greene played end on the Clark School team. In one play he ran with the ball from the opponents' 35-yard line to their 20-yard line before he was downed. How far did the ball travel?

2. Rules require the ball to be in play again after 25 seconds. Jack centered the ball for the next play just 6 seconds before the time limit was up. How long was the ball not in motion?

3. Clark School won by a score of 36 to 7. What was the difference between the scores?

4. After the game, Tom and some of the boys went to his house for sandwiches and pop. The boys drank 9 of the 14 big bottles of pop which Tom's mother had left in the refrigerator for them. How many bottles of pop were unopened when the boys left Tom's house?

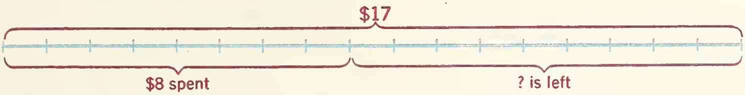
5. The boys left only 7 of the 40 sandwiches Tom's mother had made for them. How many sandwiches had the boys eaten?

What Subtraction Does

Meaning [O]

1. How much was left if Bill had \$17 and spent \$8?

2. Explain how to work Ex. 1 by using the number line.



In Ex. 1 we can think of the \$17 as the sum of two numbers. We know one of these numbers, \$8. To find the other number, we subtract.

We can write subtraction in two ways, as in the box, but we read both ways the same:

"\$17 minus \$8 is \$9," or
"\$8 from \$17 is \$9."

\$17 *minuend*
−8 *subtrahend* ↑
\$9 *remainder* Check
\$17 − \$8 = \$9

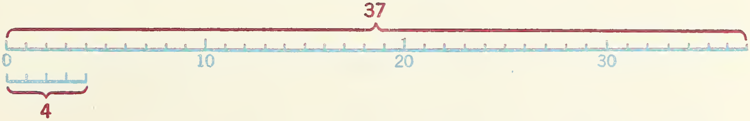
3. The "other number," or the **remainder**, in Ex. 1 is \$? . The remainder may be the number left or the number gone. Which is it in Ex. 1?

4. Tell from the box the name of the number from which we subtract; the name of the number that is subtracted.

5. In the box add the remainder and the subtrahend. Why do you get the minuend? Is this a good way to check a subtraction example?

6. Ann has 37 stamps and Gail only 4. Ann has how many more stamps than Gail? Gail has how many fewer than Ann?

In this problem we use subtraction to compare two numbers. 37 − 4 = ? The "other number," ? , is the **difference** between the numbers that are given. Explain how the comparison is shown by using the number lines below.



Subtraction (S.) Facts; Related Facts

Helpers |0|

1. Turn to page 292. Cover the answers and see if you can say correctly all 81 of the basic subtraction facts.

2. Tell what you write in the remainder when 0 is in the subtrahend.

3. Say all the facts that have a remainder of 0. Then make a rule for subtracting any number from an equal number.

4. Make a rule for facts that have 1 as the subtrahend.

5. 6 − 3 = 3 is a double. Say five more doubles. How can you use doubles to help you with subtraction facts that are near doubles?

6. For help in subtracting from a teen number, think of the number as a 10 and some ones. Subtract first from the 10. Then add the ones to that remainder. Make a dot picture on the board and show how this rule works for the example 15 − 7.

7. How can you use an A. fact for help with a S. fact?

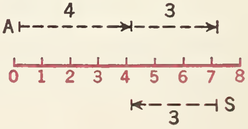
Related addition and subtraction facts go together to make whole stories. The related addition and subtraction facts in the whole story about 8, 9, and 17 are:

8 + 9 = 17; 9 + 8 = 17; 17 − 8 = 9; 17 − 9 = 8.

8. Say the four related addition and subtraction facts for

a. 4, 8, and 12; b. 6, 3, and 9; c. 9, 7, and 16.

On this number line, we may add by counting to the right from 0 and subtract by counting to the left from the end of the distance for the minuend.



9. Explain how this line shows 4 + 3 = 7 and 7 − 3 = 4.

10. On a line at the board, show 3 + 4 = 7 and 7 − 4 = 3.

Subtraction Families

Higher-decade S. [O]

Each subtraction fact gives its name to a family of examples. If you know a subtraction fact, you should be able to say the remainders for all the examples in its family.

A

The 8 − 5 family

18	28	48	78
−5	−5	−5	−5
13	23	43	73

B

The 16 − 7 family

26	46	56	86
−7	−7	−7	−7
19	39	49	79

1. What subtraction family is illustrated in box A? Give four more examples in this family.

2. In the 8 − 5 family, how do you know without subtracting what the ten's figure in each answer will be?

3. What subtraction family is illustrated in box B? Give four more examples in this family.

4. In the 16 − 7 family, why is the ten's figure in each answer 1 less than the ten's figure in the minuend?

[W]

On folded paper write the remainders for rows 5–12.

	a	b	c	d	e
5.	15 − 2	26 − 3	84 − 3	51 − 3	62 − 7
6.	39 − 6	62 − 5	35 − 6	64 − 8	74 − 6
7.	42 − 3	75 − 4	63 − 4	24 − 7	81 − 8
8.	63 − 8	45 − 7	23 − 6	35 − 8	56 − 5
9.	27 − 3	82 − 9	71 − 6	81 − 7	52 − 4
10.	34 − 2	64 − 9	37 − 5	59 − 2	46 − 4
11.	45 − 3	59 − 3	48 − 9	80 − 4	52 − 6
12.	25 − 9	40 − 5	26 − 4	68 − 5	93 − 5

13. Make up a set of 5 subtraction problems, using the numbers in row 5.

Can You Subtract Larger Numbers?

Inventory Test 4 [W]

1. When plans were made for the June science camping trip, Mr. Lane, the head counselor, decided to take only 56 boys.

In May, he had taken 63 boys. How many fewer boys were signed up for the June trip than for the May trip?

2. On the way to the Park camping ground, 75 miles away, the campers stopped for lunch. They still had 49 miles to go. How many miles had they already driven?

3. When they left home, the campers had brought 176 sandwiches. At the lunch stop along the way, 149 sandwiches were eaten. How many sandwiches were left?

4. One luggage truck carried about 4,500 lb. of duffel bags and equipment. A smaller truck carried tents and a canoe weighing in all about 1,785 lb. How much more weight did the big truck carry than the small one?

Subtracting with Two-Place Numbers

Without and with borrowing [O]

Just as we can add numbers by parts, we can subtract by parts too.

A

Short way

$$\begin{array}{r} 50 \text{ and } 6 \\ -10 \text{ and } 2 \\ \hline 40 \text{ and } 4, \\ \text{or } 44 \end{array} \qquad \begin{array}{r} 56 \\ -12 \\ \hline 44 \end{array}$$

B

Short way

$$\begin{array}{r} 70 \text{ and } 14 \\ -10 \text{ and } \ \ 6 \\ \hline 60 \text{ and } \ \ 8, \\ \text{or } 68 \end{array} \qquad \begin{array}{r} \overset{7}{\cancel{8}}\,\overset{\textcircled{14}}{\cancel{4}} \\ -1\,6 \\ \hline 6\,8 \end{array}$$

1. 56 − 12 = ? We can separate these numbers according to tens and ones and subtract, as in box A. Tell how to subtract first ones then tens, the short way.

2. 84 − 16 = ? When we separate 84 into 80 and 4, why can we not subtract the ones?

But we can separate 84 as in box B, letting one part be 10 less than 80, or 70, and the other part be 10 more than 4, or 14. Tell how to subtract the short way. We call this changing of groups **borrowing.**

The little figures in box B show how we borrow. You should try to do the subtracting without writing these figures.

[W]

Copy these examples and find the remainders:

	a	b	c	d	e	f	g
3.	78 −21	56 −27	95 −30	69 −6	87 −13	$0.98 −0.05	$0.46 −0.15
4.	46 −13	32 −16	62 −8	51 −17	46 −19	$0.82 −0.36	$0.63 −0.07
5.	76 −20	82 −48	52 −27	67 −7	94 −87	$0.37 −0.28	$0.46 −0.29
6.	56 −32	83 −25	64 −56	25 −7	34 −28	$0.60 −0.20	$0.82 −0.23

Three Places in the Minuend

Borrowing [O]

A

$$\begin{array}{r} 9\,4\,8 \\ -\,2\,1\,5 \\ \hline 7\,3\,3 \end{array}$$

B

$$\begin{array}{r} 5\,\overset{7}{\cancel{8}}\,\overset{\textcircled{12}}{\cancel{2}} \\ -\,3\,7 \\ \hline 5\,4\,5 \end{array}$$

C

$$\begin{array}{r} \overset{3}{\cancel{4}}\,\overset{\textcircled{12}}{\cancel{2}}\,7 \\ -\,1\,3\,5 \\ \hline 2\,9\,2 \end{array}$$

D

$$\begin{array}{r} \overset{4}{\cancel{5}}\,\overset{\textcircled{13}}{\cancel{4}}\,\overset{\textcircled{12}}{\cancel{2}} \\ -\,1\,6\,8 \\ \hline 3\,7\,4 \end{array}$$

1. In Ex. A why did we not have to borrow? Begin at the right. Subtract ones from ones, tens from tens, and hundreds from hundreds.

2. In this way tell how to subtract
a. 768 – 24; **b.** 385 – 24; **c.** 426 – 320.

3. In Ex. B we could not subtract the ones, so we changed the grouping of the tens and ones without changing the value of the number. Why are 7 tens and 12 ones equal to 8 tens and 2 ones? Tell about the subtracting in Ex. B.

4. On the board show the borrowing in
a. 734 – 216; **b.** 545 – 37; **c.** 627 – 19;
d. 846 – 228; **e.** 723 – 498; **f.** 543 – 195.

5. In Ex. C we cannot subtract in ten's place, so we borrow 1 hundred (10 tens) from the 4 hundreds and add the 10 tens to the 2 tens. Explain.

6. On the board show the borrowing in
a. 548 – 263; **b.** 627 – 43; **c.** 326 – 251; **d.** 405 – 95;
e. 607 – 127; **f.** 243 – 173; **g.** 308 – 78; **h.** 216 – 85.

7. In Ex. D we cannot subtract in one's or in ten's place. So we borrow 1 ten and 1 hundred. Explain the borrowing. Why does 400 + 130 + 12, the changed minuend, equal 542?

8. On the board show the borrowing for these examples:
a. 413 – 258; **b.** 762 – 68; **c.** 592 – 294; **d.** 827 – 98;
e. 935 – 862; **f.** 742 – 18; **g.** 243 – 89; **h.** 635 – 78.

9. In subtracting money numbers, what must we remember?

When you cannot subtract in any place, borrow 1 of the units of next higher value and change it to make 10 of the units needed.

[W]

Subtract. Check by adding the subtrahend and the remainder.

	a	b	c	d	e	f
10.	389 −46	264 −128	429 −284	605 −275	\$1.80 −0.91	\$7.63 −0.81
11.	707 −77	326 −248	514 −67	453 −259	\$3.62 −0.68	\$2.44 −0.75

0's in the Minuend

3-place and 4-place minuends [O]

1. In Ex. A we cannot subtract in one's place, so we must borrow a ten. But what figure is in ten's place?

Why can't we borrow anything from 0?

In 206 there are 20 tens, so we can borrow 1 ten, leaving 19 tens. Explain.

2. In Ex. B we borrow 1 ten from how many tens? How many tens are left?

3. In Ex. C we borrow twice. The 4,637 becomes 3,000 + 1,500 + _?_ + _?_. Explain.

4. In Ex. D we borrow 1 ten from 300 tens. Why can we use 2,990 + 15 instead of 3,005?

Try to change minuends in your head. Study Ex. E.

Ones: *Think*, "3 from 7 = 4."

Tens: *Think*, "8 from 3, no; borrow 1 from 6 hundreds, leaving 5; 8 from 13 = 5."

Hundreds: *Think*, "6 from 5, no; borrow 1 from 4 thousands, leaving 3; 6 from 15 = 9."

Thousands: *Think*, "2 from 3 = 1."

The remainder in Ex. E is _?_.

A

$$\begin{array}{r} \scriptstyle 1\;9\;\textcircled{16} \\ \cancel{2}\cancel{0}\cancel{6} \\ -\;78 \\ \hline 128 \end{array}$$

B

$$\begin{array}{r} \scriptstyle 6\;9\;\textcircled{10} \\ \cancel{7}\cancel{0}\cancel{0} \\ -\;246 \\ \hline 454 \end{array}$$

C

$$\begin{array}{r} \scriptstyle 3\;\textcircled{15}\,\textcircled{13} \\ \cancel{4},\cancel{6}\cancel{3}7 \\ -\;2,683 \\ \hline 1,954 \end{array}$$

D

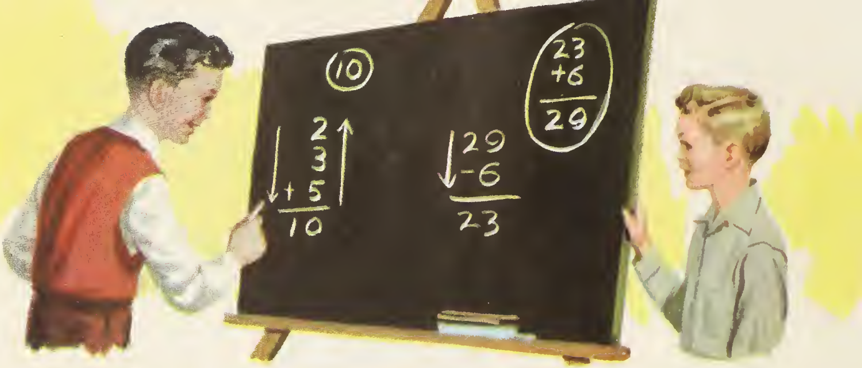
$$\begin{array}{r} \scriptstyle 2\;9\;9\;\textcircled{15} \\ \cancel{3},\cancel{0}\cancel{0}\cancel{5} \\ -\;286 \\ \hline 2,719 \end{array}$$

E

$$\begin{array}{r} 4,637 \\ -\;2,683 \\ \hline 1,954 \end{array}$$

[W]

➤ **Extra Practice.** Work Sets 9–13.



Checking Sums and Remainders

[O]

Tom's young brother Ted asked, "What does checking mean?"

Tom said: "I'll show you on your blackboard. In adding, we find the sum by adding down. Then we add up and find the sum. When we compare the two sums to see if they are equal, we are checking our addition."

Tom also told Ted how to check subtraction. He said: "The remainder and the subtrahend are the two parts of the minuend. Then we can check our work by adding these two parts together and comparing their sum with the minuend."

1. Explain the checking of the addition which Tom showed Ted in the picture and the checking of the subtraction.

2. In box A, compare the sum of 47 and 35 with the minuend, 82. Are they equal? Then why is 47 the correct other part?

3. The check is shorter in box B. Add upward. Ones: 7 + 5 = 12. The 2 equals the 2 in the minuend. Tens: 1 + 4 + 3 = ? Does this sum equal the 8 in the minuend?

A

$$\begin{array}{r} 82 \\ -35 \\ \hline 47 \end{array} \qquad \text{Check} \quad \begin{array}{r} 47 \\ +35 \\ \hline 82 \end{array}$$

B

$$\begin{array}{r} 82 \\ -35 \\ \hline 47 \end{array} \uparrow \qquad \text{Add to check}$$

[W]

4. Solve and check: **a.** 94 − 38; **b.** 73 − 56; **c.** 62 − 29.

Estimating Sums and Remainders

[O]

A	Estimate
428	400
753	800
519	500
+94	+100
1,794	1,800

B	Estimate
824	800
−596	−600
228	200

In box A, the addends are rounded in order to estimate the sum. In box B, the numbers are rounded to estimate the remainder. Rounding helps you to add or subtract "in your head."

1. In box A, tell how each addend is rounded. Then explain why 1,794 is a reasonable answer.

2. In box B, is 228 close enough to 200 to be considered reasonable?

3. Rounding to tens, estimate the sum of these numbers: 28, 56, 14, 97.

[W]

4. Add; then check by rounding to thousands and estimating: 7,254, 6,902, 14,073. Write your work as in box A.

5. Subtract; check by rounding to thousands and estimating: 8,640 − 3,251. Write your work as in box B.

Work the examples below and check by estimating.

	a	b	c	d	e	f
6.	96	332	604	3,480	4,059	$82.54
	84	416	576	926	768	79.05
	27	764	482	6,748	2,574	2.68
	31	295	951	5,281	10,364	15.27
	+50	+974	+430	+7,827	+6,928	+97.62
7.	854	786	401	7,052	4,307	$70.13
	−474	−87	−273	−2,059	−1,289	−4.52
8.	359	544	800	6,205	5,049	$94.09
	−168	−168	−381	−2,698	−763	−57.18

Practice in Addition and Subtraction

[W]

Copy each example. Estimate the remainder and write it beside the example. Subtract, and use the estimate as a check.

	a	b	c	d	e
1.	628 −419	$7.64 −0.38	5,460 −531	3,516 −1,604	21,958 −10,439
2.	406 −218	$40.00 −15.36	3,900 −627	2,900 −436	47,604 −18,417
3.	700 −59	$90.07 −12.52	4,210 −1,762	4,003 −685	94,058 −4,629
4.	400 −8	$60.00 −0.07	7,823 −587	40,079 −816	30,003 −4,208
5.	215−60	503−27	786−197	216−38	462−87
6.	600−46	214−98	906−818	340−76	500−60

Copy each example. Estimate the sum and write it beside the example. Then add, and use the estimate as a check.

	a	b	c	d	e
7.	547 +658	$9.75 +0.69	7,809 +3,608	4,989 +763	28,507 +16,389
8.	297 78 +46	$4.87 3.67 +0.59	1,376 295 +684	7,657 499 +3,564	82,970 45,098 +37,596
9.	387 746 527 492 +69	$5.95 7.89 6.98 4.95 +8.48	2,684 367 4,019 38 +76	75 2,097 644 7 +281	59,284 7,691 28,052 6,548 6,037 +9,580

Extra Practice. Work Sets 14 and 15.

Finding n

The letter **n** can stand for any number.

Missing addend [O]

A

$n + 9 = 16$

$8 + n = 14$

$12 = n + 7$

$17 = 9 + n$

1. In the addition examples in box A, tell what the addend **n** stands for. Explain what you did to find the missing addend in each example.

2. To find **n** in $n + 9 = 16$, we could write our work, "$16 - 9 = n$." Tell how you would write each of the other examples in box A to find **n**.

3. Tell how to find **n** in $68 + n = 99$; in $n + 306 = 419$.

When we know the sum of two addends and we know one of the addends, we can subtract to find the other addend.

Missing minuend

B

$n - 7 = 8$

$6 = n - 9$

$n - 6 = 7$

$5 = n - 8$

4. In each subtraction example in box B, tell what the minuend, **n**, stands for. Explain what you did to find **n** in each example.

5. To find **n** in $n - 7 = 8$, we could write, "$8 + 7 = n$." Tell how to write the work for the other examples in box B.

6. Tell how to find **n** in $n - 25 = 13$; in $163 = n - 82$.

In subtraction, the minuend is the sum of the remainder and the number subtracted. If we know the two numbers, we can add them to find the minuend.

[W]

Find **n** in Ex. 7 to 16.

7. $n + 28 = 75$
8. $n - 46 = 23$
9. $86 = n - 17$
10. $123 + n = 476$
11. $n - 78 = 145$
12. $n + 264 = 398$
13. $742 = n - 325$
14. $n + 29 = 81$
15. $39 = n - 87$
16. $278 + n = 905$

The Museum of Science

Differentiating A. and S.; estimating answers [O]

To combine groups, we add.
To take a group apart or compare groups, we subtract.

Tell for each problem whether you would add or subtract. Then estimate the answer.

1. A group of 19 boys and 15 girls in Miss Pike's class visited the Museum of Science. How many were in the group?

2. Jack found that the Museum catalog listed these exhibits: astronomy, 3; communications, 9; history of man, 4; natural history, 17; physical science, 16; public health, 3; transportation, 16. How many exhibits were on display?

3. Sam found an exhibit showing the first telephone, with only 46 parts, and today's telephone, with 433 parts. How many more parts than the first telephone does today's telephone have?

4. The temperature of the aquarium water, 73°, was how much warmer than the room temperature of the Museum, 68°?

5. Ann found a model of pyramids in Egypt, with 2,500 tiny figures of workmen. Ann began to count the little workmen but gave up after counting 27. How many more were there?

6. In the Museum shop, Joe spent 65¢ for a mineral collection and 25¢ for a book on shells. How much did he spend?

[W]

Now go back and solve the problems. Check each answer.

Hidden Questions

2-step problems; A. and S. [O]

1. Amy bought a skirt for $3.98 and a blouse for $2.98. **a.** How much did she pay for both? **b.** How much change did she receive from a $10 bill?

This problem has two questions. You must answer the first question before you can answer the second. Below is the same problem with one question asked and the other question "hidden":

Amy bought a skirt for $3.98 and a blouse for $2.98. How much change did she receive from a $10 bill?

There are still 2 steps in the solution of the problem. The first step is to answer hidden question a, "How much did she pay for both the skirt and the blouse?"

In these problems tell why you must answer question a before you can answer question b:

2. Ted's mother gave him $2.00 to pay for some groceries. Ted put this money in his wallet with his own money. He paid $1.36 for the groceries, and bought nothing else. When he got back from the store he had $1.19 in his wallet. **a.** How much change did he owe his mother? **b.** How much of his own money was in the wallet?

3. Mrs. Evans wants to get to the station 15 minutes before her train leaves at 5:15 P.M. She needs 30 minutes for the trip from her house to the station. **a.** At what time must she reach the station? **b.** When should she leave home?

4. Mrs. Howe's regular telephone service for local calls costs $3.75 a month. Last month she paid 56¢ more for extra local calls. Her total bill, including long-distance calls, was $7.00. **a.** What was the total charge for local service? **b.** What did her long-distance calls cost her last month?

[W]

Now write each problem with only question b asked. Then solve the problem.

Finding Hidden Questions

2-step problems; A. and S. **[O]**

Some of the following problems have a hidden question which must be answered before you can answer the problem question. Read each problem carefully and tell whether or not it has a hidden question. If it has, tell what the hidden question is.

1. To patch some holes in the doghouse roof, Max needed four pieces of board with the following lengths: 16 in., 21 in., 13 in., and 9 in. He sawed these pieces from a board 64 in. long. How long was the piece that was left?

2. When Tony went to visit his grandparents, his father took him 8 miles to the railroad station. Then he rode 135 miles on the train and 26 miles on a bus to get to his grandparents' farm. How far did Tony travel in all?

3. A candy store bought 25 lb. of sour balls. After 12 lb. had been sold, the rest was mixed with other hard candy to make a mixture that weighed 30 lb. in all. How many pounds of other candy had to be added to the sour balls?

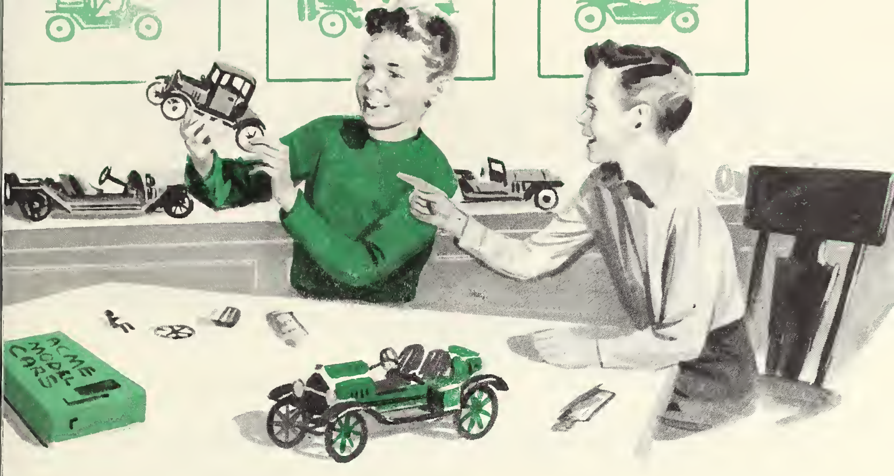
4. At the end of the year, the Gold Thimble Sewing Club had $4 left in the treasury, so the girls decided to give a party for their mothers. They could get 2 quarts of ice cream for $1.25 and cupcakes for $1.12. That would leave how much money for favors and prizes?

5. The girls in Grade 6 sold 131 calendars to earn money for the Science Club, and the boys sold 96. The girls sold how many more calendars than the boys did?

6. On Monday, Mrs. Bishop put 37 dozen pansy plants on sale at her roadside stand. That day she sold 19 dozen. Tuesday morning she put 13 dozen more plants with the unsold ones. How many dozen plants in all were on sale Tuesday morning?

[W]

Now go back and solve the problems. Write all your work.



When We Multiply

Inventory Test 5 [W]

Each week Bill and Joe buy kits of parts for building model antique automobiles.

1. One week Joe bought 2 kits for making models. Each kit cost 63¢. What did Joe pay for the 2 kits?

2. Bill bought eight 5¢ tubes of cement so they would be sure to have enough. What did he spend for the cement?

3. The next week Bill bought 2 kits for making electric coupés. At 89¢ each, what did Bill pay for the 2 kits?

4. So they could each have two model roadsters, Joe bought 4 kits of those parts one week. At 59¢ each, what did Joe pay for these kits?

5. Joe painted the wheels of all his models yellow. Bill made his wheels red. Bill bought 6 tubes of paint at 25¢ a tube. How much did he pay for the paint?

6. What did 2 racers cost at $1.35 each?

7. At the end of twelve weeks, each boy had spent $14.25. What did both boys spend in all?

The Meaning of Multiplication (M.)

Order of factors [O]

1. If 8 children can sit at each of the lunchroom tables in the picture, how many children can sit at five of the tables?

First find the total by adding five 8's, as in box A. The sum is _?_.

Since the groups of children are equal, a quicker way to find the total is to use the fact "five 8's are 40." Explain the two ways of writing this multiplication fact that are shown in box B.

A

$$\begin{array}{r} 8\\ 8\\ 8\\ 8\\ +8\\ \hline 40 \end{array}$$

To see five 8's, draw on the board a 45-inch line and number the inches. Start at the 0 point and mark off five groups of 8 inches. At what point on the line does the last group end? Do five 8's equal 40?

B

$$\begin{array}{rl} 8 & \textit{multiplicand}\\ \times 5 & \textit{multiplier}\\ \hline 40 & \textit{product} \end{array}$$

$$5 \times 8 = 40$$

2. Look at box B again. We say that the numbers 8 and 5 are **factors** of 40. Which factor tells the size of each of the equal groups? Which factor tells the number of equal groups there are? The factor that tells the size of the groups is called the _?_, and the factor that tells the number of groups is called the _?_. The answer in a multiplication example is called the _?_.

3. Another lunchroom has 8 tables. Only 5 children can sit at each of these tables. How many children can be seated in all? Eight 5's = ?

This time, 5 tells the size of the equal groups, so 5 is now the _?_; 8 tells the number of equal groups, so 8 is now the _?_. The numbers multiplied (the factors) have changed places. Is the product changed? Does 8 × 5 equal 5 × 8? Explain.

4. 3 × $52 = $156, so 52 × $3 = $_?_. Tell why.

5. In working the example 982 × 6, John wrote:

$$\begin{array}{r} 982 \\ \underline{\times 6} \end{array}$$

Was he wrong? Explain why we can multiply by the smaller number in examples of this kind.

Multiplication is a short way of adding equal groups.

The multiplicand tells the size of the groups, and the multiplier tells the number of groups. These two numbers are factors of the answer, or product.

We may use the factors in any order.

Remembering the Multiplication (M.) Facts

Helpers [O]

1. Tell a fact in which 3 and 5 are factors; in which 7 and 4 are factors; in which the product is 72.

2. Now turn to page 293, cover the answers, and quickly say the 81 multiplication facts.

3. Tell what you write in the product when 0 is in the multiplier or in the multiplicand. Why is it easy to work an example when 0 is in the multiplier or in the multiplicand?

4. Say all the facts that have 1 as a factor. Then make a rule for finding the product of 1 and any other number.

5. If you know the product of 6 × 9, do you also know the product of its reverse, 9 × 6? Explain.

Helps for Multiplying Tens, Hundreds, Thousands

Without carrying [O]

1. Sometimes matches come in books of 20. How many matches are there in 3 books?

3×20, or 3×2 tens $= 6$ tens, or 60.

Explain the check in box A.

A

$$\begin{array}{r} 20 \\ \times 3 \\ \hline 60 \end{array} \qquad \begin{array}{r} \text{Check} \\ 20 \\ 20 \\ +20 \\ \hline 60 \end{array}$$

2. On the board find 4×50. Check by adding.

3. What is the cost of 4 boxes of strawberries at 40¢ a box?

You can multiply this way: 4×40¢ $= 160$¢, or \$1.60.

Or you can write "\$0.40" instead of "40¢" and multiply this way: $4 \times \$0.40 = \$1.60$.

4. Toothpicks come in boxes of 300. How many toothpicks are there in 4 boxes?

For 4×300, *think*, "4×3 hundreds."

4×3 hundreds $= 12$ hundreds, or 1,200.

Explain the check in box B.

B

$$\begin{array}{r} 300 \\ \times 4 \\ \hline 1{,}200 \end{array} \qquad \begin{array}{r} \text{Check} \\ 300 \\ 300 \\ 300 \\ +300 \\ \hline 1{,}200 \end{array}$$

5. On the board find 2×600. Check.

6. $3 \times 2{,}000 = ?$ 3×2 thousands $= 6$ thousands, or _?_.

7. On the board find $3 \times 4{,}000$. Check by adding.

We multiply tens, hundreds, and thousands as we multiply ones.

[W]

Find the products in rows 8 and 9.

	a	b	c	d	e	f
8.	$\begin{array}{r} 30 \\ \times 2 \\ \hline \end{array}$	$\begin{array}{r} 50 \\ \times 7 \\ \hline \end{array}$	$\begin{array}{r} 20¢ \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 40¢ \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 3{,}000 \\ \times 3 \\ \hline \end{array}$	$\begin{array}{r} \$6.00 \\ \times 3 \\ \hline \end{array}$
9.	$\begin{array}{r} 400 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 700 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 100 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 5{,}000 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 8{,}000 \\ \times 9 \\ \hline \end{array}$	$\begin{array}{r} \$40.00 \\ \times 2 \\ \hline \end{array}$

10. Mrs. Long bought 3 cases of canned corn. If a case holds 24 cans, how many cans did she buy?

In box C, how is 24 separated into parts? Why can we add 60 and 12 to get our final answer?

Explain the short way in box D.

C

20 + 4
×3
60 + 12,
or 72

D

Short way

24
×3
72

11. 4 × 879 = ?

In box E we multiply ones, then tens, then hundreds, and show each product separately. Explain.

The carried figures are added mentally in box F. Explain the multiplying and the carrying.

E

879
×4
36
28
32
3,516

F

Short way

879
×4
3,516

12. Mrs. Peck bought 5 cushions at $3.04 each. How much did she pay?

Box G. Explain the work. We write the dollar sign and the decimal point in the product, allowing _?_ places at the right for cents.

G

$3.04
×5
$15.20

[W]

Multiply the short way in Ex. 13–18.

	a	b	c	d	e	f
13.	62 ×4	90 ×6	18 ×6	79 ×5	$2.03 ×7	2,408 ×3
14.	842 ×5	706 ×8	420 ×9	567 ×7	$5.80 ×5	3,056 ×8
15.	260 ×9	508 ×6	657 ×8	700 ×7	$2.89 ×6	4,687 ×9

16. 5 × 4,006 **17.** 7 × $5.00 **18.** 8 × 15,730

▶ **Extra Practice.** Work Sets 16 and 17.

Can You Multiply by Larger Numbers?

Inventory Test 6 [W]

Linda works after school at the Argus Candy Company. She helps count boxes and check prices of candy bought and sold by the company. See if you can solve these problems of Linda's:

1. What would 45 pounds of Mint Sticks cost at 83¢ a pound?

2. How much would 125 pounds of chocolate-coated nuts cost at $1.28 a pound?

3. How much would the Oceanside Candy Shop be billed for 165 pounds of the De Luxe Assortment at $1.15 a pound?

4. The Great Plains Candy Company shipped 95 pounds of Foamy Fudge at 85¢ a pound. What should the bill show for total cost?

5. The Argus Company bought 115 pounds of chocolates at $1.08 a pound. What was the total cost?

Helps with 2-Place Multipliers

[O]

1. Jean is buying ten 3¢ stamps. How much do they cost? 10 × 3¢ = ?

1 × 3 = ? 1 ten × 3 = _?_ tens, or 30. The stamps cost _?_¢.

2. On the board show, by adding ten 3's, that 10 × 3¢ = 30¢.

3. How much will twenty 3¢ stamps cost? 20 × 3¢ = ?

2 × 3 = ? 2 tens × 3 = _?_ tens, or _?_. The stamps will cost _?_¢.

Multiply by tens as you multiply by ones. Make the product mean tens by writing 0 in one's place.

4. In the box, think of 26 as 6 ones and 2 tens and multiply by these two parts: 6 × 14 = 84; 2 tens × 14 = 28 tens. Where do we write the 28 to show that it means 28 tens? Why are the 84 and the 28 called **partial products?** Explain the rest of the work.

$$\begin{array}{r} 14 \\ \times 26 \\ \hline 84 \\ 28 \\ \hline 364 \end{array} \left.\begin{array}{l} \\ \\ \\ \\ \end{array}\right\} \textit{partial products} \qquad \begin{array}{r} \text{Check} \\ 26 \\ \times 14 \\ \hline 104 \\ 26 \\ \hline 364 \end{array}$$

[W]

Multiply. Be sure to write the 0 in one's place.

	a	b	c	d	e	f	g	h
5.	3 ×40	9 ×30	21 ×20	62 ×10	32 ×50	41 ×30	86 ×20	112 ×30

Multiply as in the box and check.

6.	41 ×26	84 ×16	36 ×42	74 ×13	28 ×24	23 ×84	53 ×39	65 ×47

Extra Practice. Work Set 18.

Writing Partial Products Correctly

Multiplicands of 2, 3, and 4 places [O]

1. A bushel of corn weighs 56 lb. How much do 24 bu. weigh?

Box A: 4 ones × 56 = 224 ones. 2 tens × 56 = 112 tens. Where do we start to write the second partial product? Explain.

2. 70 × 32 = ? Study box B. 0 ones × 32 = ? 7 tens × 32 = 224 tens. Why can we write both partial products on the same line?

A

$$\begin{array}{rrrr} \text{Thousands} & \text{Hundreds} & \text{Tens} & \text{Ones} \\ & & 5 & 6 \\ & \times & 2 & 4 \\ \hline & 2 & 2 & 4 \\ 1 & 1 & 2 & \\ \hline 1, & 3 & 4 & 4 \end{array}$$

B

$$\begin{array}{r} 32 \\ \times 70 \\ \hline 2{,}240 \end{array}$$

C

$$\begin{array}{r} 50 \\ \times 30 \\ \hline 1{,}500 \end{array}$$

3. 30 × 50 = ? Explain the multiplying in box C above.

4. A grocer paid $0.67 a dozen for 36 dozen eggs. How much did he pay in all?

Explain the multiplying in box D.

5. Don reads 213 words a minute. How many will he read in 15 min.?

Multiplying a 3-place number is as easy as multiplying a 2-place number. Explain Ex. E.

D

$$\begin{array}{r} \$0.67 \\ \times 36 \\ \hline 4\;02 \\ 20\;1 \\ \hline \$24.12 \end{array}$$

E

$$\begin{array}{r} 213 \\ \times 15 \\ \hline 1\;065 \\ 2\;13 \\ \hline 3{,}195 \end{array}$$

[W]

In rows 6–8 find the products. Check by reversing factors.

	a	b	c	d	e	f
6.	62 ×34	45 ×26	58 ×30	978 ×42	$0.47 ×38	2,481 ×23
7.	27 ×60	70 ×81	65 ×18	196 ×79	$3.16 ×65	7,458 ×34
8.	39 ×45	70 ×90	68 ×50	432 ×36	$6.54 ×73	6,512 ×56

Extra Practice. Work Set 19.

Helps with Three-Place Multipliers

Multiplying by smaller number [O]

A

```
    468
   ×327
  3 276
  9 36
140 4
153,036
```

1. A farmer sold 327 hogs whose average weight was 468 lb. Find the total weight.

Box A. We multiply the average, 468 lb., as if it were the real weight of each hog.

How do we get the one's partial product? the ten's and the hundred's partial products?

The partial product 936 means 936 tens. What does the partial product 1404 mean?

2. How many partial products will there be in the example 39 × 451? in 176 × 4,338? How can you tell?

B

Not this	But this
12 ×235	235 ×12

3. How many pencils are in 235 boxes with 12 in each box?

Box B. Because 12 is the size of each group, we write, "235 × 12." Can we get the same product by finding 12 × 235? Why is this better?

4. Tell how to change the following before multiplying:

a. 462 × 8 **b.** 246 × 23 **c.** 1,954 × 75

[W]

Copy, and find the products. You may reverse factors.

	a	b	c	d	e	f
5.	237 ×128	569 ×256	27 ×419	$4.38 ×127	3,129 ×645	7,615 ×462
6.	857 ×794	236 ×587	41 ×392	$6.24 ×361	7,632 ×958	8,546 ×398
7.	764 ×218	581 ×736	64 ×319	$5.89 ×215	351 ×5,872	9,837 ×264

Extra Practice. Work Set 20.

Zero (0) in Multiplication

In multiplier [O]

A

One zero or more in the multiplier

$$\begin{array}{r} 46 \\ \times 80 \\ \hline 3{,}680 \end{array} \qquad \begin{array}{r} 427 \\ \times 340 \\ \hline 17\,080 \\ 128\,1 \\ \hline 145{,}180 \end{array} \qquad \begin{array}{r} 843 \\ \times 206 \\ \hline 5\,058 \\ 168\,60 \\ \hline 173{,}658 \end{array} \qquad \begin{array}{r} 3{,}572 \\ \times 400 \\ \hline 1{,}428{,}800 \end{array}$$

Box A. When there is a 0 in any place in the multiplier, it means that there is nothing to multiply in that place, so we must write "0" in the proper place in the partial product.

1. Explain how the red product 0's in box A are placed.

Copy on the board and finish these examples:

2. 20 × 7,134 3. 360 × 2,781 4. 602 × 4,826

In multiplicand

B

One zero or more in the multiplicand

$$\begin{array}{r} 280 \\ \times 7 \\ \hline 1{,}960 \end{array} \qquad \begin{array}{r} 3{,}070 \\ \times 6 \\ \hline 18{,}420 \end{array} \qquad \begin{array}{r} 5{,}009 \\ \times 15 \\ \hline 25\,045 \\ 50\,09 \\ \hline 75{,}135 \end{array} \qquad \begin{array}{r} 4{,}800 \\ \times 428 \\ \hline 38\,400 \\ 96\,00 \\ 1\,920\,0 \\ \hline 2{,}054{,}400 \end{array}$$

Box B. When 0 is in the multiplicand there is nothing to be multiplied in that place. We write "0" in the product as a placeholder. If there is a carried figure, we write it in place of the 0.

5. Explain each red product figure in box B.

Copy on the board and finish these examples:

6. 15 × 6,047 7. 62 × 6,050 8. 293 × 7,000

C	D	E
	4,600	6,003
308	×340	×702
×500	184 000	12 006
154,000	1 380 0	4 202 10
	1,564,000	4,214,106

9. Study box C above. Why are there three 0's in the product? Explain how we get each product 0. How do we get the 4 in thousand's place?

10. Copy these examples on the board and work them:

a. 40 × 208 **b.** 60 × 5,007 **c.** 30 × 406

d. 300 × 702 **e.** 600 × 405 **f.** 400 × 308

11. Box D. What is the first partial product? Where is it written? What is the second partial product? the third? Why do we start to write the third partial product in hundred's place?

12. Box E. Why do there seem to be only two partial products? Explain all the work in box E.

[W]

Copy rows 13–15 and write your work.

	a	b	c	d	e	f
13.	406 ×27	600 ×29	250 ×16	631 ×500	4,700 ×29	603 ×381
14.	6,800 ×560	7,006 ×904	4,800 ×509	6,003 ×470	300 ×200	2,806 ×405
15.	2,806 ×659	1,945 ×704	1,080 ×906	3,007 ×600	8,920 ×300	9,040 ×25

Extra Practice. Work Sets 21 and 22.

Four-Place Multipliers and Multiplicands

[O]

In box A, a 4-place number is multiplied by a 4-place number.

A

$$\begin{array}{r} 3{,}604\\ \times 1{,}297\\ \hline 25\,228\\ 324\,36\\ 720\,8\\ 3\,604\\ \hline 4{,}674{,}388\end{array}$$

Check

$$\begin{array}{r} 1{,}297\\ \times 3{,}604\\ \hline 5\,188\\ 778\,20\\ 3\,891\\ \hline 4{,}674{,}388\end{array}$$

1. How many partial products are there in the solution in box A? Why?

2. Why is the 4 of the fourth partial product written under the 1 of the multiplier?

3. Study the check in box A. Explain why there seem to be only three partial products.

4. For the example $\begin{array}{r}6{,}030\\ \times 3{,}125\\ \hline\end{array}$, when you start to multiply by 3 (thousands) where will you write the 0 of the partial product? Explain.

B

Check

$$\begin{array}{r} 3{,}125\\ \times 6{,}030\\ \hline 93\,750\\ 18\,750\,0\\ \hline 18{,}843{,}750\end{array}$$

5. The check for Ex. 4 is shown in box B. Where are the partial products written when you multiply by the two 0's in 6,030?

[W]

Multiply each number in Ex. 6 to 10 by 3,125. Check by reversing the factors.

6. 6,715 **7.** 9,006 **8.** $81.56 **9.** 7,080 **10.** 4,670

11–15. Multiply each number in Ex. 6 to 10 by 7,693 and check.

16. In a recent year there were 4,693 pupils enrolled in the schools of Callwood. The cost per pupil was $154.60. What was the total cost for schools in Callwood that year?

Turn back to page 33 and write multiplication problems for the examples in row 6.

Find the answer for each of your problems.

Estimating Products

[O]

a. 40 × 700 = 28,000
b. 200 × 600 = 120,000
c. 20 × 8,000 = 160,000

1. In Ex. a, compare the number of 0's in the product with the number in both multiplier and multiplicand.

2. Make the same comparison in Ex. b and Ex. c.

3. Make a rule about the number of 0's in these products.

4. How do we get 28 in Ex. a? 12 in Ex. b? 16 in Ex. c?

Without paper and pencil, tell the products in Ex. 5–8.

5. 60 × 300 6. 400 × 200 7. 80 × 50 8. 30 × 5,000

If both factors of a multiplication example end in 0, you can quickly get the product by multiplying the other figures and writing beside that product as many 0's as there are at the ends of both factors.

To estimate any product, you can round each factor and multiply as above. Your answer will be a round number.

[W]

For each example three estimated answers are given. Copy the one that is nearest right. Check by working the example.

9. 4 × 789 = ? 2,800 32,000 3,200
10. 63 × 38 = ? 2,400 1,800 2,800
11. 72 × 58 = ? 5,600 4,200 3,500
12. 89 × 196 = ? 1,800 18,000 16,000

Write an estimated answer for each example. Then work the example and compare your estimate with the product.

	a	b	c	d
13.	7 × 69	38 × 51	82 × 68	94 × 27
14.	93 × $0.58	62 × 389	6 × $5.97	8 × $0.52
15.	742 × 365	821 × 394	52 × 684	42 × $6.95

The Lunchroom

Differentiating A., S., M.; estimating answer [O]

For each problem tell whether you should add, subtract, or multiply. Then give an estimate of the answer.

1. Mary paid 23¢ for lunch at school, and her father paid 99¢ at a restaurant. How much less did Mary's lunch cost than her father's?

2. One day at a large table there were seated 16 children, then 14 children, then 11, then 15. How many children in all used the large table?

3. The lunchroom floor is 74 feet long and 42 feet wide. How many feet greater is the length than the width?

4. The lunchroom manager has ordered 18 dozen glasses at $0.64 a dozen. How much will the glasses cost in all?

5. Lunch tickets costs 23¢. How much will 15 tickets cost?

6. About 145 glasses of milk are sold a day. At that rate, how many glasses of milk will be sold in 22 days?

[W]

Now go back and write your work for problems 1–6.

Do You Understand?

Test of Information and Meaning 1

Write your answers.

1. In two different ways, write the meaning of 742.

2. $5 \times 1{,}000 + 6 \times 100 + 2 \times 10 + 7 \times 1 = ?$

3. Round to the nearest thousand: **a.** 7,829; **b.** 2,824,726.

4. Write in figures: **a.** three tens; **b.** seven hundreds; **c.** forty-five tens; **d.** two hundred seven hundreds.

5. Round to the nearest million:
a. 8,194,608; **b.** 3,408,852,016; **c.** 19,822,694

6. Show by a number line that $10 - 3 = 7$.

7. Write as Arabic numbers: **a.** XC; **b.** XXXIV; **c.** MD; **d.** LXXXV.

8. From the box copy **a.** an addend; **b.** a minuend; **c.** a sum; **d.** a product; **e.** a remainder; **f.** a multiplier.

$$\begin{array}{r} 5 \\ +2 \\ \hline 7 \end{array} \qquad \begin{array}{r} 9 \\ -3 \\ \hline 6 \end{array} \qquad \begin{array}{r} 4 \\ \times 8 \\ \hline 32 \end{array}$$

9. Write two examples in the $3 + 8$ addition family.

10. To find the difference between two numbers, do you add, subtract, or multiply?

11. For $28 + n = 46$, what would you do to find n?

12. To check subtraction, what should you do?

13. Write in Roman numerals: **a.** 75; **b.** 107; **c.** 1,050.

14. Write two examples in the $14 - 8$ subtraction family.

15. Does the multiplier or the multiplicand tell the size of the equal groups?

16. Do you put $ and decimal point in partial products?

17. In working the example $4{,}285 \times 86$, by which number will you multiply?

18. Estimate the product for 9×418.

Do You Make Mistakes?

Diagnostic Test 1

Copy and work the examples in rows 1–5. If you make mistakes in any row, review the Study Pages. For more practice with examples of the same kind, use the Practice Sets.

	a	b	c	d	Study Pages	Practice Sets
1.	24 +32	472 +15	215 +385	6,494 +8,363	8, 11	1-8
2.	38 −25	795 −84	491 −79	9,423 −895	14, 17, 18	9-11
3.	405 −28	700 −275	3,002 −589	$50.00 −25.98	19	12-13
4.	43 ×3	97 ×8	$4.05 ×7	4,852 ×6	30, 31	16-17
5.	54 ×23	$0.68 ×46	$6.75 ×108	2,050 ×3,704	33-38	18-22

Can You Work Problems?

Problem Test 1

1. Jack is saving money for a bicycle. He has $18 and needs $14 more. How much does the bicycle cost?

2. The sea route between New York and Vancouver by way of the Panama Canal is 6,992 miles. The route around South America is 16,333 miles. How much shorter is the route by way of the Panama Canal than around South America?

3. Mr. Ambrose has an orchard with 12 rows of apple trees set 14 trees to a row. How many apple trees does Mr. Ambrose have in all?

4. For her television set, Mrs. Parks paid $42 down and $18 a month for 12 months. Find the total cost of the set.

5. Mr. Hill receives $75 a week. Mr. Fox receives $3,500 a year (52 weeks). Which man receives more per year? How much more?

6. A farm of 121 acres has 35 acres in corn, 28 acres in alfalfa, 16 acres in tobacco, and 3 acres in yards and buildings. The rest is in pasture. How many acres are there in pasture?

7. A tank holds 175 gallons of fuel oil. When there were still 50 gallons left in it, the tank was filled again. How much did the filling cost at 13¢ a gallon?

8. Mr. Jackson washes windows in an office building at an average rate of 65 windows a day. At 15¢ a window, how much will Mr. Jackson earn in a week of 5 days?

9. Don spent $9.95 of the $14 that he earned selling magazines. He put the rest in the bank with the $65 that he already had there. How much did he then have in the bank?

How Well Can You Figure?

Computation Test 1

	a	b	c	d	e
1.	47 −34	32 +26	$5.78 ×4	82 −23	756 −214
2.	175 +286	604 −128	520 ×7	46 ×57	4,257 −1,874
3.	35 −29	628 −165	472 −48	843 +179	537 −248
4.	700 −285	654 ×37	$5.05 ×46	3,470 ×609	$53.83 +26.65

5. 8
7
4
6
3
+5

6. $41.11
63.02
50.34
+21.41

2

When We Divide

Inventory Test 7 [W]

Bob, Jack, and Tom are working on their stamp collections to get them ready for the Hobby Show.

1. Bob stopped at the post office and bought some new commemorative stamps. He got 32 stamps in blocks of 4. How many blocks did he get?

2. Tom bought a packet of 25 mixed stamps. He offered to trade $\frac{1}{3}$ of them for some of Bob's extra commemorative stamps. How many stamps would Tom give Bob? Is this exactly $\frac{1}{3}$ of the 25 stamps?

3. Jack's stamp album has 250 pages. He has divided it into 5 equal sections. How many pages are there in each of the sections?

4. Bob's album once belonged to his father, who had begun 6 different kinds of collections in it. There are now 1,824 stamps in the album. Divided equally among the collections, how many stamps would there be in each collection?

5. Tom ordered some approval sheets from which he kept 139 stamps. He put them on the table in rows of 8. How many complete rows did he have? How many other stamps?

6. The 3 boys together bought 500 transparent hinges to use in fixing stamps on the pages. What was each boy's share of the hinges?

7. They also bought 3 sets of tongs to use in handling the stamps and a magnifying glass for help in reading the letters and figures on the stamps. These tools cost $12 in all. The boys shared the cost equally. How much did each boy pay?

8. The boys spent about 36 hours during February working on their stamp collections. If the time was divided equally among the 4 weeks, how many hours a week did they spend?

What Division Does

Measurement D.; meaning [O]

1. Sue and Al had 32 carrots to tie in bunches of 8. After Sue had tied 1 bunch and Al had tied 2 bunches, how many carrots were left? How many bunches could they make in all?

Sue and Al were really measuring. They measured the large group, 32 carrots, by the small group of 8 and found that there are four 8's in 32. This is **measurement division.**

2. The answer for Ex. 1 can be found by subtracting 8's, as in box A. How many 8's were subtracted in box A?

3. When we know the division facts, it is quicker to divide, as in box B. How many 8's are there in 32?

Box B shows two ways to write the division fact. Each way can be read, "8's in 32 = 4" or "32 divided by 8 is 4" or "8 is contained in 32 four times."

A

$$\begin{array}{rl} 32 & \\ -8 & (1) \\ \hline 24 & \\ -8 & (2) \\ \hline 16 & \\ -8 & (3) \\ \hline 8 & \\ -8 & (4) \\ \hline 0 & \end{array}$$

B

$$\begin{array}{r} 4 \\ 8\overline{)32} \end{array}$$

or

$32 \div 8 = 4$

Measuring a group by a smaller group to find how many of the small groups it contains is called measurement division.

Fractional-part D.; meaning [O]

When we divide, we do not always use measurement division. Ex. 4 and 5 tell about a different kind of division.

4. Fred and Kay also had 32 carrots, but they wanted to divide theirs into 8 equal bunches. How many carrots would there be in each bunch?

The picture above shows how Fred and Kay started to divide the 32 carrots into 8 equal groups. Explain their method. Make a diagram on the board to show how they finished the dividing. How many carrots are there in each of the equal groups? In each $\frac{1}{8}$ of 32 carrots there are _?_ carrots.

When we divide in order to find the size of one of the equal parts of a group or a number, we are using **fractional-part division.**

5. A quicker way to find the answer to Ex. 4 is to think that each bunch will be 1 of the 8 equal parts of 32 carrots, or $\frac{1}{8}$ of 32 carrots. To find $\frac{1}{8}$ of 32, we divide 32 by 8. $32 \div 8 = ?$ $\frac{1}{8}$ of 32 carrots = _?_ carrots.

The kind of division in which we find how many in one of the equal parts of a group or number is called fractional-part division.

We write our work for both fractional-part division and measurement division the same way.

Which Kind of Division (D.) Problem?

[O]

1. From the box, tell what we call the number that is divided; the number by which we divide; the answer.

4 ← *quotient*
8)32 ← *dividend*
↑
divisor

2. In $54 \div 6 = 9$, which number is the divisor? Which is the dividend? Which is the quotient?

In measurement division, the quotient tells the number of equal groups that are contained in a larger group (the dividend). In fractional-part division, the quotient tells how many in each of the equal parts of the dividend.

3. How many rows of 8 pins each can Ann make from 48 pins?

Why is this measurement division? Does the quotient tell how many 8's are contained in 48? $48 \div 8 = 6$.

4. Ann bought 6 pencils for 30¢. Each pencil cost _?_¢.

Why is this fractional-part division? Does it take $\frac{1}{6}$ of 30¢ to pay for each pencil? $\frac{1}{6}$ of 30¢ = _?_¢.

[W]

For each of Ex. 5–10, write "measurement" if the quotient tells the number of equal groups and "fractional-part" if the quotient tells the size of each of the equal parts.

5. Our schoolroom has 40 seats in 5 equal rows. How many seats are there in each row?

6. Ann's step is 2 feet long. How many steps will she take in walking 100 feet?

7. At $5 a pair, how many pairs of shoes will $10 buy?

8. Mr. Ashley drove 237 miles in 6 hours. This was at the rate of how many miles an hour?

9. How many pecks are there in 40 qt.? (8 qt. = 1 pk.)

10. Forty-two children were divided equally into 6 rows. How many children were in each row?

Helps for Learning Division Facts

[O]

Read each of Ex. 1–4 in two ways. Tell the dividend, the divisor, and the quotient in each exercise.

1. $16 \div 8 = 2$ 2. $5\overline{)40} = 8$ 3. $\begin{array}{r} 3 \\ 7\overline{)21} \end{array}$ 4. $27 \div 9 = 3$

5. In each of Ex. 1–4, multiply the divisor by the quotient. Compare your answer with the dividend. What is true in each case? Why can we say that the quotient and the divisor are factors of the dividend?

6. In $36 \div 9 = ?$ which number can be thought of as a product? as a factor? How do we find the missing factor?

7. Whenever we know a product and one of its two factors, how can we find the missing factor?

8. The 81 division facts are given on page 294. Turn to that page, cover the answers, and quickly say all the facts.

9. In division, when do you have a zero in the quotient? Give an example.

10. Say the facts in which 1 is the divisor. Then make a rule for dividing any number by 1.

11. Say the facts that have 1 as the quotient. Then make a rule for dividing any number by an equal number.

12. If you know the division fact $42 \div 6 = 7$, how does it help you in finding the answer for $42 \div 7$?

13. If you know the multiplication fact $8 \times 9 = 72$, how does it help you in finding the answer for $72 \div 9$?

Multiplication facts go with related division facts to make whole stories. The whole story about 4, 8, and 32 is:
$4 \times 8 = 32$; $8 \times 4 = 32$; $32 \div 8 = 4$; $32 \div 4 = 8$.

Tell the whole story in multiplication and division about
14. 3, 7, and 21. 15. 4, 9, and 36. 16. 7, 8, and 56.

Helps for Learning Uneven Division Facts

Table numbers [O]

1. How many stamps at 6¢ each can I buy with 20¢?

I can buy as many stamps as there are 6's in 20. In box A, how many times is 6¢ taken from 20¢? How much is left over?

In box B, how many 6's do we take from 20 all at one time?

Box C shows two short ways to write this fact with its remainder.

A

$$\begin{array}{r} 20\text{¢} \\ -6\text{¢} \\ \hline 14\text{¢} \\ -6\text{¢} \\ \hline 8\text{¢} \\ -6\text{¢} \\ \hline 2\text{¢} \end{array}$$

B

$$\begin{array}{rl} 3, \text{R}2 & \\ 6\overline{)20} & \\ \underline{18} & (3 \times 6) \\ 2 & \end{array}$$

C

$$\begin{array}{r} 3, \text{R}2 \\ 6\overline{)20} \end{array}$$

or

$$20 \div 6 = 3, \text{R}2$$

For box C *think*, "$20 \div 6$ is not in any division table, but $18 \div 6$ is. 18 is the **table number** to use because it is next smaller than 20. $18 \div 6 = 3$; so $20 \div 6 = 3$, R2."

2. Tell the table number for: $7\overline{)24}$; $5\overline{)32}$; $3\overline{)16}$; $8\overline{)35}$.

3. In Ex. 1, the quotient tells how many stamps. Does the remainder mean stamps or cents?

4. As he plants corn, Don puts 4 kernels of corn in each hill. How many hills will he make from 25 kernels? (See box D.)

What does the quotient tell? the remainder? Explain the check in E.

D

$$\begin{array}{r} 6, \text{R}1 \\ 4\overline{)25} \\ 24 \\ \hline 1 \end{array}$$

E

Check

$$\begin{array}{r} 4 \\ \times 6 \\ \hline 24 \\ +1 \\ \hline 25 \end{array}$$

[W]

Divide and check as in boxes D and E above.

	a	b	c	d	e	f	g
5.	$2\overline{)7}$	$6\overline{)17}$	$3\overline{)16}$	$8\overline{)27}$	$5\overline{)33}$	$7\overline{)30}$	$8\overline{)51}$
6.	$4\overline{)37}$	$6\overline{)53}$	$7\overline{)46}$	$8\overline{)45}$	$9\overline{)32}$	$9\overline{)58}$	$7\overline{)36}$
7.	$4\overline{)13}$	$9\overline{)25}$	$6\overline{)43}$	$4\overline{)31}$	$5\overline{)37}$	$3\overline{)26}$	$9\overline{)65}$
8.	$5\overline{)42}$	$9\overline{)50}$	$7\overline{)53}$	$8\overline{)61}$	$4\overline{)35}$	$9\overline{)80}$	$6\overline{)35}$

Jane's Corn Roast

2-place dividend and quotient [O]

1. For the corn roast, Jane put 60 ears of corn in 3 equal piles. How many ears did she put in each pile? $60 \div 3 = ?$

60 is 6 tens. 6 tens $\div$ 3 = 2 tens, or 20. There were _? ears of corn in each pile.

2. Tell the quotients: **a.** $80 \div 2$; **b.** $120 \div 4$; **c.** $400 \div 8$.

We divide tens just as we divide ones.

3. How many 4¢ ice-cream cups can Jane buy with 96¢?

Tens: Why is 8 the table number for $4\overline{)9}$? $8 \div 4 = ?$ We write "2" in ten's place in the quotient.

When we subtract 8 tens, or 80, we are subtracting twenty 4's. Explain.

When we bring down the 6 ones to go with the 1 ten left over, the 16 to be divided next is 16 ones. Why?

$$\begin{array}{r|l} \text{Tens} & \text{Ones} \\ 2 & 4 \\ 4\overline{)9} & \overline{6} \\ 8 & \quad (20 \times 4) \\ \hline 1 & 6 \\ 1 & 6 \quad (4 \times 4) \\ \hline \end{array}$$

Ones: $16 \div 4 = ?$

In what place in the quotient do we write "4"? Explain.

[W]

Write your work for these as in the box:

4. $3\overline{)69}$ 5. $2\overline{)76}$ 6. $4\overline{)92}$ 7. $3\overline{)96}$ 8. $5\overline{)75}$

Helps for Dividing Larger Numbers

2-place quotient [O]

1. $\frac{1}{8}$ of 743 = 743 ÷ 8 (box A).

Can 7 hundreds be divided into 8 parts giving 1 hundred to each part?

Then 74 tens becomes the **first partial dividend.** Why is this called a partial dividend? Why is a small × placed over the 4 of 74?

A

$$\begin{array}{r|c|c|l}
 & \text{Hundreds} & \text{Tens} & \text{Ones} \\
 & & 9 & 2,\ \text{R7} \\
 & & \times & \\
\hline
8) & 7 & 4 & 3 \\
 & 7 & 2 & \quad (9 \text{ tens} \times 8) \\
\hline
 & & 2 & 3 \\
 & & 1 & 6 \quad (2 \times 8) \\
\hline
 & & & 7
\end{array}$$

First Partial Dividend (getting tens)

Divide tens: 74 ÷ 8 = ? *Think,* "The table number is 72. 72 ÷ 8 = 9." Write "9" in ten's place in the quotient.

Multiply and compare: 9 × 8 = 72. 72 tens are less than 74 tens, so 9 is not too large for a quotient figure.

Subtract and compare: 74 − 72 = 2. Can 2 be divided by 8? If it could be, you would know that the quotient figure was too small.

Bring down the 3 ones. Think of the 2 tens and 3 ones as 23 ones, the **second partial dividend.**

Second Partial Dividend (getting ones)

Explain what was done in dividing the 23 ones in box A.

Remember that the divisor and quotient are factors of the dividend. Explain the check in box B.

B

Check

$$\begin{array}{r}
92 \\
\times 8 \\
\hline
736 \\
+7 \\
\hline
743
\end{array}$$

For each exercise below tell the first partial dividend. Then tell where you would put × to show the place of the first quotient figure.

	a	b	c	d	e	f
2.	$5\overline{)175}$	$3\overline{)186}$	$4\overline{)254}$	$8\overline{)426}$	$9\overline{)649}$	$6\overline{)495}$
3.	$2\overline{)111}$	$3\overline{)289}$	$6\overline{)325}$	$5\overline{)383}$	$3\overline{)167}$	$8\overline{)587}$
4.	$4\overline{)172}$	$2\overline{)192}$	$3\overline{)235}$	$7\overline{)575}$	$2\overline{)137}$	$7\overline{)652}$

[W]

Now copy rows 2–4, divide, and check, as in boxes A and B.

5. In box C, why is the first partial dividend 13 hundreds?

6. In box C, how many 4's were subtracted in all?

7. In box D, why is 0 in one's place in the quotient?

8. In box E, why is 0 in ten's place in the quotient?

9. For 42,653 ÷ 5 = ? tell the first partial dividend and the number of quotient figures.

C

$$\begin{array}{r} \overset{\times}{3}39\text{, R1} \\ 4\overline{)1{,}357} \\ 1\,2 \\ \hline 15 \\ 12 \\ \hline 37 \\ 36 \\ \hline 1 \end{array}$$

D

$$\begin{array}{r} \overset{\times}{5}0\text{, R2} \\ 9\overline{)452} \\ 45 \\ \hline 2 \end{array}$$

E

$$\begin{array}{r} \overset{\times}{3}05 \\ 8\overline{)2{,}440} \\ 2\,4 \\ \hline 40 \\ 40 \\ \hline \end{array}$$

Study the examples in row 10 and tell the mistakes.

	a	b	c	d	e
10.	$\begin{array}{r} 15\text{, R6} \\ 7\overline{)1{,}056} \\ 7 \\ \hline 35 \\ 35 \\ \hline \end{array}$	$\begin{array}{r} 5\;\,9 \\ 5\overline{)2{,}950} \\ 2\,5 \\ \hline 45 \\ 45 \\ \hline \end{array}$	$\begin{array}{r} 8{,}501 \\ 8\overline{)6{,}406} \\ 6\,4 \\ \hline 06 \end{array}$	$\begin{array}{r} 801 \\ 6\overline{)4{,}836} \\ 4\,8 \\ \hline 36 \\ 6 \\ \hline \end{array}$	$\begin{array}{r} 8\;50 \\ 4\overline{)35{,}000} \\ 32 \\ \hline 2\,0 \\ 2\,0 \\ \hline \end{array}$

Estimate the quotients for rows 11–14 below. For Ex. 11a, *think*, "15 hundreds ÷ 3 = 5 hundreds. The quotient will be about 500." For Ex. 11b, *think*, "7 thousands ÷ 4 = 1 thousand, remainder 3. The quotient will be almost 2,000."

[W]

Copy and divide the following as in boxes C to E above:

11.	$3\overline{)1{,}527}$	$4\overline{)7{,}228}$	$2\overline{)9{,}411}$	$3\overline{)27{,}017}$	$4\overline{)68{,}037}$
12.	$5\overline{)3{,}600}$	$9\overline{)6{,}350}$	$4\overline{)8{,}360}$	$7\overline{)25{,}619}$	$8\overline{)36{,}015}$
13.	$8\overline{)8{,}185}$	$6\overline{)2{,}401}$	$8\overline{)9{,}075}$	$9\overline{)4{,}826}$	$5\overline{)74{,}283}$
14.	$2\overline{)7{,}017}$	$7\overline{)7{,}058}$	$6\overline{)2{,}412}$	$5\overline{)8{,}605}$	$9\overline{)75{,}785}$

Extra Practice. For more practice, work Sets 23 and 24.

Finding and Using an Average

Meaning [O]

1. Would you always use the same number to tell how many ounces there are in a pound? to tell how many players there are on a regular baseball team?

2. Would you always use the same number to tell how many ounces a baby weighs? to tell how many runs were scored in a baseball game?

Some numbers stand for things that always stay the same, such as the number of inches in a foot or the number of dimes in a dollar. Other numbers stand for things that do not stay the same, such as the number of inches in the height of a growing plant or the number of miles covered each hour of a trip.

There are many times when it is not convenient to use a long list of these changing numbers. It is better to use just one number that represents all the numbers in the group that we are talking about. We call this number an **average.**

3. Suppose someone asked you how many minutes you spend eating lunch. If you timed yourself every day for a week, would you be likely to find that you spent *exactly* the same number of minutes every day?

You might find that you spent 18 minutes one day, 24 the next, 21 the next, 19 the next, and so on. Instead of saying all these different numbers, could you just estimate and say, "About 20 minutes, on the average" to give someone else a good idea of the time you spend eating lunch?

In Ex. 3, instead of estimating the number 20, you could have found an average by using the numbers in this way:

First find the total of 18, 24, 21, and 19,—which is 82. Then find $\frac{1}{4}$ of 82, or 21.

4. Why does 21 tell you the number of minutes you would have spent if you had spent the same number of minutes each day? Why is this a good number to use as an average?

5. At the cook-out, these boys cooked the following numbers of hamburgers: Don, 14; Jim, 18; Bob, 15; Dick, 21. What was the average number of hamburgers cooked by a boy?

If each boy had cooked the same number of hamburgers, what part of the total number would he have made? How do you find one of the equal parts of a total?

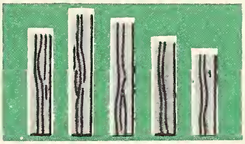
The box below shows how to find the average number of hamburgers cooked by a boy. Explain the work.

$$\begin{array}{rl} 14 & \text{(Don)} \\ 18 & \text{(Jim)} \\ 15 & \text{(Bob)} \\ +21 & \text{(Dick)} \\ \hline 68 & \end{array} \qquad \tfrac{1}{4} \text{ of } 68 = \begin{array}{r} 17 \\ 4\overline{)68} \\ \underline{4} \\ 28 \\ \underline{28} \end{array} \quad \textit{(average)}$$

How many boys cooked more than the average number of hamburgers? How many cooked fewer than the average? Do you think that 17 is a good average to use? Explain.

Is this a two-step problem? See if you can make up a find-the-average problem that is not a two-step problem.

To find the average of several numbers, you divide the sum of the numbers by the number of addends.



6. The lengths of 5 sticks of wood used for a trellis were 10 in., 12 in., 11 in., 9 in., and 8 in. What was the average length of stick used?

On the board, side by side, draw lines to stand for these sticks of wood. Explain how you might take inches off the long sticks and add them to the short ones to make each stick the same length—that is, the average.

Work the problem on the board, using figures.

Problems about Averages

[W]

Write your work for Ex. 1–6.

1. On a fishing trip, Joe caught 12 fish, Don caught 14, Pete caught 9, and Bill caught 17. What was the average number caught?

2. The attendance at the last 4 weekly meetings of the Science Club was as follows: 12, 10, 13, and 15. What was the average attendance?

3. Joe rode his bicycle 21 miles in 3 hours. What was his average rate in miles per hour? (Do you need to find the total before you divide in this kind of problem?)

4. In 6 days, Mr. Fox drove 1,488 miles. How many miles did he average a day?

5. At an average of 8 miles an hour, how many hours will it take Sam to ride 48 miles? (Do you have to find the average in this example or will you use the average just as though it were a number which does not change?)

6. In our room, each person borrows an average of 3 library books a week. How many books a week will all 35 of us borrow?

When We Divide by a 2-Place Number

Inventory Test 8 [W]

The sixth-grade pupils of Stockwell School have been planning a Thanksgiving party. These are some of the problems they have had to solve. Write your work for these problems:

1. The committee has planned a party lasting 120 minutes. How many hours long will the party be?

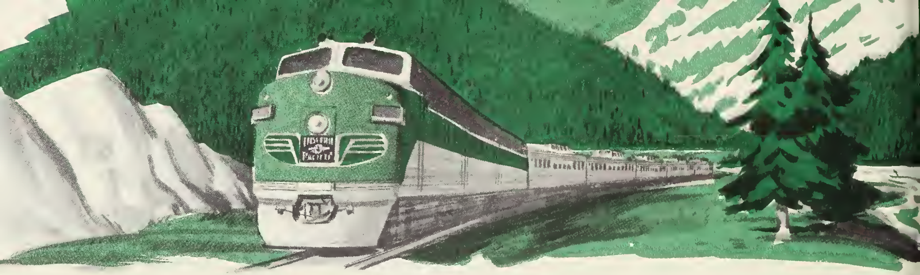
2. To pay for the use of a moving-picture projector, $3.85 had to be collected from the class. Miss Pike knew that $3.85 could not be divided evenly among the 36 pupils in the class, so she agreed to pay the remainder. What would each pupil's share be? How much would Miss Pike pay?

3. For use in games to be played, the committee divided a package of 288 slips of paper into 36 smaller equal packages. How many slips of paper would be in each small package?

4. Ice cream cups for the group of 37 (including Miss Pike) would cost in all $3.33. What was the cost per person?

5. If other classes joined the sixth grade for refreshments, ice cream and cookies could be bought at a better price. At a total cost of $10.44, what would ice cream and cookies cost apiece for 58 people?

6. A large group in another building spent $122.50 to cover the cost of costumes and equipment for entertainment as well as refreshments for 98 people. What was the cost per person?



Helps for Dividing by a 2-Place Divisor

1. At an average of 60 miles an hour, how many hours does it take the Rocky Mountain Limited to run 180 miles?

At the board find the answer in these ways:

Find how many 60's you can subtract from 180.

Make division tables with divisor 6 and with divisor 60, as in box A. Divide as far as 18 ÷ 6 and 180 ÷ 60 to find how many 60's in 180.

Divide as in box B. How many 60's are subtracted all at one time?

The side work in box B makes it easier to tell what the quotient figure will be. *Think*, "18 ÷ 6 = 3, so 180 ÷ 60 = 3." Write "3" in one's place in the quotient.

Explain the check in box C.

1-place quotient [O]

A

$\begin{array}{r} 1 \\ 6\overline{)6} \end{array}$ $\begin{array}{r} 1 \\ 60\overline{)60} \end{array}$

$\begin{array}{r} 2 \\ 6\overline{)12} \end{array}$ $\begin{array}{r} 2 \\ 60\overline{)120} \end{array}$

$\begin{array}{r} 3 \\ 6\overline{)18} \end{array}$ $\begin{array}{r} 3 \\ 60\overline{)180} \end{array}$

B

Side work

$\begin{array}{r} 3 \\ 60\overline{)180} \\ \underline{180} \end{array}$ (3 × 60) $\begin{array}{r} 3 \\ 6\overline{)18} \end{array}$

C

Check

$\begin{array}{r} 60 \\ \underline{\times 3} \\ 180 \end{array}$

[W]

Copy, divide, and check as in boxes B and C.

	a	b	c	d
2.	$20\overline{)80}$	$30\overline{)90}$	$20\overline{)160}$	$70\overline{)210}$
3.	$40\overline{)360}$	$60\overline{)240}$	$80\overline{)400}$	$90\overline{)720}$

Dividing by Tens and Ones

Trial quotient the true quotient [O]

1. Mr. Dow had to plant 169 onion sets. He put 21 sets in each row. How many full rows did he make?

Why is this measurement division? We measure 169 by what smaller group?

Divide. To divide 169 by 21, *think*, "16 tens ÷ 2 tens = 8." Where is the quotient figure written? Why?

A

$$\begin{array}{r} 8,\ \text{R1} \\ 21\overline{)169} \\ \underline{168}\ \ (8 \times 21) \\ 1 \end{array}$$

Side work

$$\begin{array}{r} 8 \\ 20\overline{)160} \end{array}$$

Check

$$\begin{array}{r} 21 \\ \underline{\times 8} \\ 168 \\ \underline{+1} \\ 169 \end{array}$$

Multiply and compare. 8 × 21 = 168. Is 168 less than 169?

Subtract and compare. 169 − 168 = _?_ (the remainder).

2. Mrs. Higgins bought a bag of 32 oranges for $1.60. How much did each orange cost?

$1.60 is 160¢, so 1 orange costs $\frac{1}{32}$ of 160¢. Why is this fractional-part division?

160¢ ÷ 32 = ? What table number do we use for 16 tens ÷ 3 tens? Explain box B.

In box C, $1.60 is not changed to 160¢. Explain the division and the 0's in the quotient.

B

$$\begin{array}{r} 5¢ \\ 32\overline{)160¢} \\ \underline{160} \end{array}$$

C

$$\begin{array}{r} \$0.05 \\ 32\overline{)\$1.60} \\ \underline{1\ 60} \end{array}$$

[W]

Divide, as in box A.

	a	b	c	d	e	f
3.	$40\overline{)320}$	$90\overline{)540}$	$60\overline{)427}$	$82\overline{)341}$	$42\overline{)97}$	$33\overline{)\$1.32}$
4.	$52\overline{)129}$	$23\overline{)139}$	$41\overline{)248}$	$64\overline{)269}$	$83\overline{)581}$	$53\overline{)\$2.12}$
5.	$71\overline{)516}$	$94\overline{)752}$	$22\overline{)157}$	$72\overline{)579}$	$51\overline{)479}$	$44\overline{)\$1.76}$

6. $\frac{1}{53}$ of 286 7. $\frac{1}{72}$ of 448 8. $\frac{1}{42}$ of 220 9. $\frac{1}{32}$ of $1.92

Extra Practice. Work Set 25.

Dividing by Tens and Ones

Trial quotient not the true quotient [O]

A

$$\begin{array}{r} 2, \text{ R3} \\ 42\overline{)87} \\ \underline{84} \\ 3 \end{array}$$

B

Trial 1

$$\begin{array}{rl} 9 & \\ 36\overline{)294} & \\ \underline{324} & (9 \times 36) \end{array}$$

[Wrong]

C

Trial 2

$$\begin{array}{rl} 8, \text{ R6} & \\ 36\overline{)294} & \\ \underline{288} & (8 \times 36) \\ 6 & \end{array}$$

For work like that in box A, you have been thinking, "8 tens ÷ 4 tens," and that gave you the correct quotient figure. But this way of thinking will not always give the correct quotient figure.

1. Mr. Hand packed 294 peaches in boxes of 36 peaches each. How many boxes did he fill?

Box B. When you *think* the division, "29 tens ÷ 3 tens" you get 9 as quotient figure, but $9 \times 36 = 324$. Since 324 is more than 294, there are not as many as nine 36's in 294.

Now try 8, the next smaller number (box C). 8 is the correct quotient because $8 \times 36 = 288$, a number smaller than 294.

The product of the quotient figure and the divisor must not be greater than the part of the dividend used.

[W]

Divide and check. Try to multiply in your head.

	a	b	c	d	e	f
2.	$27\overline{)84}$	$26\overline{)49}$	$23\overline{)184}$	$25\overline{)130}$	$36\overline{)288}$	$24\overline{)\$1.44}$
3.	$24\overline{)92}$	$23\overline{)81}$	$26\overline{)208}$	$68\overline{)544}$	$45\overline{)280}$	$36\overline{)\$1.80}$
4.	$28\overline{)46}$	$22\overline{)82}$	$27\overline{)111}$	$27\overline{)219}$	$58\overline{)352}$	$48\overline{)\$1.20}$
5.	$25\overline{)87}$	$22\overline{)42}$	$38\overline{)152}$	$14\overline{)119}$	$47\overline{)282}$	$96\overline{)\$1.84}$
6.	$49\overline{)350}$	$76\overline{)684}$	$39\overline{)208}$	$47\overline{)382}$	$36\overline{)186}$	$46\overline{)\$3.22}$

Extra Practice. Work Set 26.

True Quotient after Several Trials

1-place quotient [O]

1. 198 ÷ 28 = ? Study the work in the boxes.

Why do we begin with 9?
Why isn't 9 correct?
Why do we try 8, then 7?
Tell why 7 is correct.

Trial 1	Trial 2	Trial 3
$\begin{array}{r} 9 \\ 28\overline{)198} \\ \underline{252} \end{array}$	$\begin{array}{r} 8 \\ 28\overline{)198} \\ \underline{224} \end{array}$	$\begin{array}{r} 7 \\ 28\overline{)198} \\ \underline{196} \\ 2 \end{array}$

2. For 208 ÷ 28, why can't we *think*, "20 tens ÷ 2 tens = 10"? What is the largest trial quotient figure we should ever use?

Work Ex. 3 and 4 on the board.

3. 175 ÷ 28 = ? 4. 272 ÷ 38 = ?

Try no quotient larger than 9.

If the quotient figure is too large, try the next smaller numbers until the product is no longer greater than the part of the dividend used.

You can estimate and avoid erasing. For Ex. 1 *think:*
"9 × 20 = 180, and 9 × 8 = 72; 180 + 70 is more than 198.
8 × 20 = 160, and 8 × 8 = 64; 160 + 60 is more than 198.
7 × 20 = 140, and 7 × 8 = 56; 140 + 50 is less than 198."

[W]

Divide. Estimate to find your quotient figures.

	a	b	c	d	e
5.	$36\overline{)180}$	$35\overline{)215}$	$24\overline{)195}$	$67\overline{)492}$	$57\overline{)\$4.59}$
6.	$27\overline{)162}$	$28\overline{)168}$	$37\overline{)240}$	$26\overline{)208}$	$68\overline{)\$5.64}$
7.	$73\overline{)667}$	$27\overline{)252}$	$78\overline{)312}$	$29\overline{)222}$	$49\overline{)\$3.92}$
8.	$23\overline{)218}$	$47\overline{)376}$	$38\overline{)304}$	$47\overline{)282}$	$39\overline{)\$2.73}$
9.	$58\overline{)512}$	$25\overline{)200}$	$57\overline{)456}$	$25\overline{)185}$	$28\overline{)\$1.92}$
10.	$26\overline{)180}$	$21\overline{)207}$	$36\overline{)297}$	$34\overline{)306}$	$39\overline{)\$2.47}$

Teen-Number Divisors

[O]

It is harder to estimate with teen-number divisors because you may have to try many times before you find the correct quotient figure.

1. 92 ÷ 19 = ? Study the work in boxes A–F.

If you first tried 9 as the quotient figure and then kept on trying the next smaller number each time, how many trials would you have to make before you finally got the correct quotient figure?

Even if you tried 9 first, why would it be sensible to try 6 next instead of 8 and 7?

If you knew the table of 15's, given below, would you be more likely to use 6 or even 5 as your first trial quotient instead of 9? Why?

$$\begin{array}{rrrrrrrrr} 15 & 15 & 15 & 15 & 15 & 15 & 15 & 15 & 15 \\ \underline{\times 1} & \underline{\times 2} & \underline{\times 3} & \underline{\times 4} & \underline{\times 5} & \underline{\times 6} & \underline{\times 7} & \underline{\times 8} & \underline{\times 9} \\ 15 & 30 & 45 & 60 & 75 & 90 & 105 & 120 & 135 \end{array}$$

Work Ex. 2 and 3 on the board. Tell how it would help you if you knew the table of 15's.

2. 94 ÷ 16   3. 120 ÷ 18

[W]

Divide. If you do not remember the facts you need from the table of 15's, use the table.

	a	b	c	d
4.	$17\overline{)102}$	$15\overline{)117}$	$13\overline{)107}$	$15\overline{)109}$
5.	$16\overline{)134}$	$14\overline{)63}$	$18\overline{)117}$	$17\overline{)105}$
6.	$19\overline{)140}$	$18\overline{)120}$	$16\overline{)112}$	$14\overline{)112}$
7.	$13\overline{)104}$	$16\overline{)110}$	$18\overline{)129}$	$15\overline{)125}$

Extra Practice. Work Set 27.

A

Trial 1

$$\begin{array}{r} 9 \\ 19\overline{)92} \\ \underline{171} \end{array}$$

B

Trial 2

$$\begin{array}{r} 8 \\ 19\overline{)92} \\ \underline{152} \end{array}$$

C

Trial 3

$$\begin{array}{r} 7 \\ 19\overline{)92} \\ \underline{133} \end{array}$$

D

Trial 4

$$\begin{array}{r} 6 \\ 19\overline{)92} \\ \underline{114} \end{array}$$

E

Trial 5

$$\begin{array}{r} 5 \\ 19\overline{)92} \\ \underline{95} \end{array}$$

F

Trial 6

$$\begin{array}{r} 4 \\ 19\overline{)92} \\ \underline{76} \end{array}$$

Using What You Have Learned

Practice: A., S., M., D. [W]

Copy, and do what the signs tell you to do.

	a	b	c	d	e
1.	125 37 +28	762 509 +73	84 132 +3,658	2,106 795 +5,514	43,560 8,216 +907
2.	353 598 +65	76 463 +677	2,987 45 +761	648 83 +7,642	52,275 774 +9,438
3.	685 −342	1,206 −758	3,510 −493	5,280 −2,655	23,016 −8,942
4.	132 ×25	205 ×86	1,541 ×73	864 ×123	2,048 ×309

Show any remainder with R.

5. $23\overline{)128}$ $37\overline{)302}$ $46\overline{)185}$ $8\overline{)7{,}602}$ $5\overline{)42{,}010}$

6. $19\overline{)116}$ $93\overline{)705}$ $74\overline{)635}$ $9\overline{)5{,}017}$ $3\overline{)10{,}230}$

Distinguishing process

7. A weekly magazine which costs 20¢ on the newsstands can be bought by subscription for $6.00 a year. How much money can be saved in a year by subscribing to the magazine?

8. A laundry charges 12¢ per sheet and 5¢ per pillowcase. Find the charge for laundering 6 sheets and 12 pillowcases.

9. Mrs. Tucker pays 60¢ a week for a newspaper delivered to her house each day. The newsstand price of the paper is 5¢ for the daily (Monday-Saturday) paper and 20¢ for Sunday's. How much extra does Mrs. Tucker pay each week for delivery service?

Make up division problems for the 5 examples in row 5.

Two-Place Divisors and Quotients

Quotient figures apparent [O]

A

	Hundreds	Tens	Ones		
		$\underset{\times}{2}$	4,	R20	
32)	7	8	8		
	6	4		(2 tens × 32)	
	1	4	8		
	1	2	8	(4 × 32)	
		2	0		

Check

32
×24
128
64
768
+20
788

1. Mr. Ames, the superintendent, had 788 new books to distribute equally among 32 classrooms. How many books did he send to each room? $\frac{1}{32}$ of 788 = 788 ÷ 32 (box A).

First Partial Dividend

In 788, are there enough hundreds to give 1 hundred to a room? Are there enough tens to give at least 1 ten to each room? (788 = _?_ tens and _?_ ones.) Then 78 tens is the first partial dividend, and we can put a small × over the 8 of 78 to show where the first quotient figure is to be placed.

Explain the multiplying and the subtracting.

What figure is brought down to go with the 14 tens?

Second Partial Dividend

The second partial dividend is _?_ ones. Explain.

Explain the dividing, multiplying, and subtracting for the second partial dividend. What is the remainder?

Explain the check in box A.

Explain the divisions below. We usually write our work as in Ex. 3 and 4, without showing the multiplications at the right of the example as we have been doing for 3 tens × 25 in Ex. 2.

$\underset{\times}{3}$0, R15
2. 25)765
75 (3 tens × 25)
15

7$\underset{\times}{6}$
3. 21)1,596
1 47
126
126

\$0.$\underset{\times}{8}$0, R50¢
4. 54)\$43.70
43 2
50

5. A truck averaged 28 mi. an hour over a distance of 980 mi. How many hours did it take to cover the distance? 980 ÷ 28 = ? (box B).

What is the first partial dividend? How can you tell?

How many figures will the quotient have?

Then how many divisions must you make?

In the first division, what would be your first trial quotient figure? Why?

What is the first true quotient figure? In what column do you write it? Why?

What is the second partial dividend?

In the second division, what would be your first trial quotient figure? How many trials do you make?

6–8. Answer the questions in Ex. 5 for box C; for box D; for box E.

B

35
28)980
84
140
140

C

43
18)774
72
54
54

D

$0.54
26)$14.04
13 0
1 04
1 04

E

40, R23
39)1,583
1 56
23

[W]

Divide and check. Show any final remainder with R.

	a	b	c	d	e
9.	53)2,476	24)726	27)1,890	58)5,684	27)$15.12
10.	78)6,396	37)2,240	44)3,736	32)2,214	48)$29.76
11.	58)5,073	36)3,405	78)5,694	28)847	16)$7.20
12.	28)1,528	48)1,936	59)4,032	51)3,002	27)$17.28
13.	36)2,160	19)1,444	68)3,400	16)592	19)$8.74

Extra Practice. Work Sets 28 and 29.

Three-Place Quotients

Apparent and non-apparent quotient figures [O]

A

$$\begin{array}{r}149\\78\overline{)11{,}622}\\\underline{7\,8}\\3\,82\\\underline{3\,12}\\702\\\underline{702}\end{array}$$

B

$$\begin{array}{r}204\\48\overline{)9{,}792}\\\underline{9\,6}\\192\\\underline{192}\end{array}$$

1. An orange grove has 11,622 trees, planted in 78 equal rows. Each row has how many trees?

11,622 ÷ 78 = ? Look at box A.

Why is 116 hundreds the first partial dividend?

The dividend has two more figures. Then how many figures will the quotient have in all? Why?

How many times do we divide? Explain all the division in box A.

2. Box B. Why do we have to write a 0 in ten's place in the quotient? Explain all the division.

[W]

Divide in rows 3–5. Show any remainder with R.

	a	b	c	d	e
3.	$26\overline{)5{,}768}$	$52\overline{)9{,}880}$	$16\overline{)3{,}472}$	$23\overline{)11{,}569}$	$13\overline{)\$27.30}$
4.	$46\overline{)18{,}418}$	$27\overline{)8{,}100}$	$48\overline{)9{,}605}$	$32\overline{)28{,}032}$	$16\overline{)\$64.00}$
5.	$18\overline{)9{,}168}$	$17\overline{)8{,}946}$	$19\overline{)13{,}053}$	$14\overline{)11{,}543}$	$28\overline{)\$57.96}$

➤ **Extra Practice.** Work Set 30.

Dividing by Hundreds

Meaning [O]

1. If the machines shown in the picture can fill 600 bags of cement in an hour, how long will it take to fill 1,800 bags? 1,800 ÷ 600 = ?

At the board, work these ways:

Find how many 600's you can subtract from 1,800.

Make division tables, as in A, with 6 as divisor and 600 as divisor. How many 600's in 1,800?

Divide as in box B, thinking of 1,800 as 18 hundreds. 18 ÷ 6 = 3, so 1,800 ÷ 600 = ?

Why must we write the quotient figure in one's place?

A

$$\begin{array}{r} 1 \\ 6\overline{)6} \end{array} \qquad \begin{array}{r} 1 \\ 600\overline{)600} \end{array}$$

$$\begin{array}{r} 2 \\ 6\overline{)12} \end{array} \qquad \begin{array}{r} 2 \\ 600\overline{)1{,}200} \end{array}$$

$$\begin{array}{r} 3 \\ 6\overline{)18} \end{array} \qquad \begin{array}{r} 3 \\ 600\overline{)1{,}800} \end{array}$$

B

Side work

$$\begin{array}{rl} 3 & \\ 600\overline{)1{,}800} & \\ \underline{1\ 800} & (3 \times 600) \end{array} \qquad \begin{array}{r} 3 \\ 6\overline{)18} \end{array}$$

[W]

Copy and divide, as in box B.

	a	b	c	d
2.	$300\overline{)1{,}500}$	$500\overline{)3{,}500}$	$400\overline{)1{,}600}$	$700\overline{)6{,}300}$
3.	$200\overline{)1{,}800}$	$600\overline{)2{,}400}$	$800\overline{)3{,}200}$	$900\overline{)5{,}400}$

Dividing by Any 3-Place Divisor

[O]

1. At an average of 225 mi. a day, how many days will it take to drive 1,350 mi.?

To estimate the quotient figure, you use the first figure of the divisor and the first one or two figures of the partial dividend, just as you would for a 2-place divisor. For box A, *think*, "13 (hundreds) ÷ 2 (hundreds) = ?"

Explain the division in box A.

Work these examples on the board:

2. 416)3,509 3. 384)$26.88

A

6
225)1,350
1 350

B

67
231)15,477
13 86
1 617
1 617

4. If 15,477 young trees are distributed equally among 231 towns, how many trees should each town receive?

Box B. Tell why 1,547 tens is the first partial dividend.

How many quotient figures will there be?

Work these examples on the board:

5. 320)4,800 6. 412)$124.47

7. How many barrels of flour (196 lb.) can be made from 54,000 lb. of flour?

Box C. What is the first partial dividend?

How do we know that there will be 3 figures in the quotient?

What is the last quotient figure?

8. Box D. There are no 384's in the second partial dividend, 192, so we write 0 in _?_ place in the quotient. 1920 ÷ 384 = ?

C

27
196)54,000
39 2
14 80
13 72
1 08

D

205
384)78,720
76 8
1 920
1 920

Work these examples on the board:

9. 144)80,784 10. 365)$642.40

11. 112)34,496 12. 519)367,452

Practice in Division

[W]

Divide and check. Show any remainder with R.

	a	b	c	d	e
1.	$8\overline{)326}$	$6\overline{)282}$	$5\overline{)1{,}504}$	$7\overline{)9{,}216}$	$6\overline{)\$14.76}$
2.	$52\overline{)420}$	$83\overline{)337}$	$94\overline{)470}$	$41\overline{)2{,}462}$	$62\overline{)\$24.80}$
3.	$35\overline{)285}$	$26\overline{)236}$	$47\overline{)3{,}844}$	$36\overline{)2{,}172}$	$24\overline{)\$8.40}$
4.	$48\overline{)28{,}992}$	$15\overline{)10{,}530}$	$36\overline{)28{,}818}$	$14\overline{)10{,}647}$	$12\overline{)\$24.72}$
5.	$347\overline{)2{,}776}$	$144\overline{)864}$	$128\overline{)896}$	$264\overline{)6{,}072}$	$18\overline{)\$82.62}$

6. $216\overline{)66{,}528}$ 7. $421\overline{)107{,}776}$ 8. $348\overline{)\$967.44}$

▶ **Extra Practice.** For more practice, work Set 31.

Using Division in Problems

Finding hidden question [O]

Some of these problems have two questions, one of which is hidden and must be answered first. Find each problem that has a hidden question and tell what the hidden question is.

1. A farmer received $76.80 for 160 chickens which averaged 4 lb. each in weight. How much did he get per pound?

2. If pears are sold 6 for 36¢, how much will 4 pears cost?

3. If Mr. Mills distributes 272 maps equally among 34 schools, how many maps will each school have?

4. If 40 books cost $40.80, what does each book cost?

5. The cost of 13 pictures for the school at $3.75 each was shared equally by 25 parents. How much did each parent pay?

6. Mr. Dow's car cost $2,664. He paid $664 down and the rest in 10 equal payments. How much was each payment?

[W]

Now go back and write the work for each problem.

Add? Subtract? Multiply? Divide?

Differentiating A., S., M., D. [O]

Remember: We add or multiply to find the total. We subtract to find the remainder or the difference. We divide to find how many times one group contains another group or to find the size of one of the equal parts of a group.

For each problem tell what process you will use and give the reason for your choice. Then use round numbers and estimate the answer.

1. On the average, Mr. Lane's car goes 16 mi. on a gallon of gasoline. At that rate, about how much gasoline would be used on a trip of 1,500 mi.?

2. Mr. Lane's car cost $2,664. He paid $650 in cash for the first payment. How much more did he owe?

3. If each shelf in the library holds 38 books, on the average, how many books will 22 shelves hold?

4. Rita made 16 sandwiches for the picnic, and her mother made 28. How many sandwiches did they make in all?

5. A farmer sold 8 doz. eggs at 51¢ a dozen. How much money did he receive for the eggs?

6. A printer cuts 72 small cards from each large sheet. How many large sheets will he need for 2,232 small cards?

7. In the scrap-paper drive, the 6th-grade children collected 535 lb. of scrap paper, and the 5th grade collected 475 lb. How many pounds was that from the 5th and 6th grades?

8. A fish dealer paid the fishermen 63¢ a pound for fish which he sold for 95¢ a pound. How much more did the dealer charge per pound for the fish than he paid for it?

[W]

Now go back and solve problems 1–8.

When We Measure

Inventory Test 9 [W]

1. Write five units of length and their abbreviations.

2. There are 5,280 ft. in a mile. How many yards are there?

3. If 2 lb. of candy are shared equally by 4 girls, how many ounces of candy does each girl receive?

4. What do these abbreviations stand for? **a.** gal.; **b.** pk.; **c.** pt.; **d.** lb.; **e.** bu.; **f.** sec.; **g.** T.; **h.** da.; **i.** qt.; **j.** oz.

5. 1 gal. = _?_ pt.; 1 bu. = _?_ qt.

6. Bob studies 45 min. each night. In 4 nights he studies _?_ hr.

7. Which of these months have 30 days: January? June? April? October? September? May? November?

8. Four men were 64 in., 69 in., 70 in., and 73 in. tall. Their average height was _?_ ft. _?_ in.

9. Using the tables at the right and below, find the following:

a. 4 lb. 10 oz. are _?_ oz. in all.
b. 3 T. = _?_ lb.
c. 264 pt. = _?_ gal.
d. 8 da. = _?_ hr.
e. How much more are 3 bu. than 18 pk.?
f. How many hours and minutes is it from 11 A.M. to 2:15 P.M.?
g. 3,860 lb. is how much less than 2 T.?
h. 2 rd. = 11 yd., so 10 rd. = _?_ yd.

Linear Measure

12 in. = 1 ft.
3 ft. = 1 yd.
$5\frac{1}{2}$ yd. = 1 rd.
320 rd. = 1 mi.

Liquid Measure

2 pt. = 1 qt.
4 qt. = 1 gal.

Weight

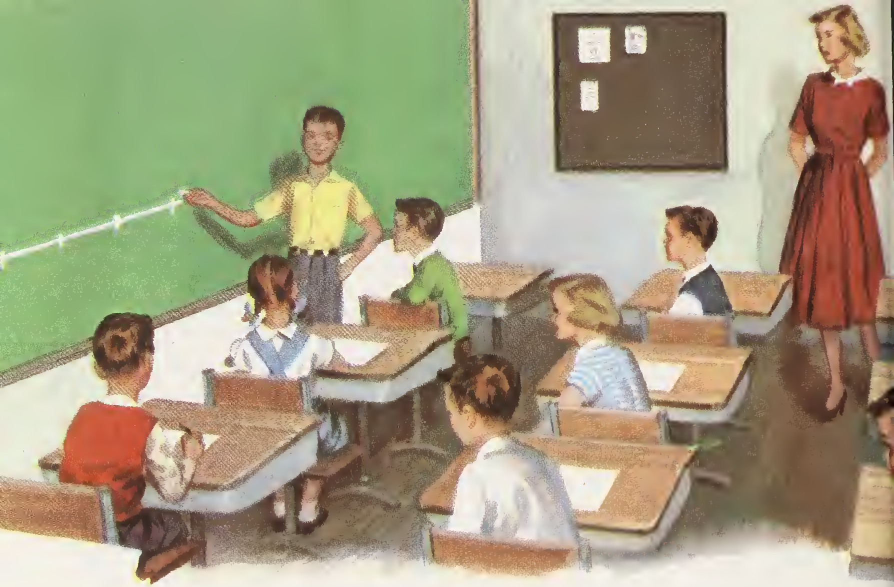
16 oz. = 1 lb.
2,000 lb. = 1 T.

Time

60 sec. = 1 min.
60 min. = 1 hr.
24 hr. = 1 da.

Dry Measure

2 pt. = 1 qt.
8 qt. = 1 pk.
4 pk. = 1 bu.



What Is Measuring?

Meaning of counting and measuring numbers [O]

1. How many children are shown in the picture? How did you find out? Is there more than one correct answer? Explain.

2. If you want to know the length of a line drawn on the board, is there anything that you can count? First you must have a unit of measure, such as a foot rule, with which you can compare the length of the line. The line on the board above has been marked off in feet, so you can quickly tell that it is about _?_ ft. long. Is that its *exact* length?

3. Suppose three different people measured the line, one using a yardstick marked off in fourths of an inch, one using a steel tape marked off in tenths of an inch, and one using a ruler marked off in sixteenths of an inch. Do you think that all three would get *exactly* the same answer? Give as many reasons for your answer as you can. Can we ever measure anything so that the answer is absolutely correct?

Numbers that tell *how many* are **counting numbers.** Numbers that tell *how much* and that are found by comparing the size of something with a unit of measure are **measuring numbers.**

Counting numbers are accurate. Measuring numbers never can be expressed with entire accuracy.

Before we had our present measuring instruments, people often used parts of their bodies as units of measure. Do we ever do this today?

4. Use the width of your palm to measure the length of your desk. How many palms long is your desk?

5. Using your foot as a unit of measure, find about how many feet long your classroom is.

6. Why would answers differ for Ex. 5?

7. Why was it a good idea that people decided on standard units of measure like the inch and the ounce, that is, measures which are the same everywhere and for everybody?

8. Name 5 standard units of measure we use today.

[W]

Would you use a counting or a measuring number to tell

9. the length of a rope?
10. the weight of a package?
11. the number of books on your desk?
12. the length of time you spend studying?
13. the number of quart bottles of milk on the doorstep?
14. the amount of grain in a bin?

Now look again at Ex. 9–14. For each question that you answered with "A measuring number," tell what unit of measure you would use.

Reference Measures You Can Use

Estimating [O]

You often need to estimate how much of something you have when no measuring instrument, such as a yardstick or quart bottle, is at hand. These reference measures may help you:

Find a part of your finger that is about **an inch** long.
See if a man's shoe is about **a foot** long.
Find one of your books that weighs about **a pound.**
Weigh 4 new pencils to see if they weigh about **an ounce.**

Many familiar things make good reference measures. For example, most doors are about **7 ft.** high, and most tables are **30 in.** high. A bag of sugar weighs **5 lb.** or **10 lb.**, and a very large bag of potatoes weighs **100 lb.**

Tom thinks that the corn is 9 ft. tall because it seems 2 ft. taller than a door. Sue thinks the weeds by the pond are 60 in. tall because they seem twice as high as a table.

1. In this way estimate the length of your schoolroom.

2. By lifting a 10-pound bag of sugar and a pail of water, estimate the weight of the pail of water.

3. Pour sand into a can until you think you have put in 5 lb. Check by weighing.

4. Without a ruler, try to draw a 6-inch line. Check with your ruler. Then repeat the work to see if you improve.

5. As in Ex. 4, draw at the board a 2-foot line. Check it.

6. What reference measure would you use to estimate the

a. length of your pencil?
b. weight of a jackknife?
c. weight of meat bought?
d. height of your room?

[W]

7. Give reference measures you might use for these units:

a. a mile
b. a yard
c. a rod
d. a second
e. an hour
f. a gallon
g. a minute
h. a quart

Use a reference measure if you need to and tell what goes in each blank.

8. The box of cereal weighs 10 _?_.

9. Jack weighs 120 _?_. His baby brother weighs 120 _?_.

10. Sam's belt is 30 _?_ long.

11. A small car ran about 100 mi. on 3 _?_ of gasoline.

12. Barbara went down to the store and back in 20 _?_.

Some measures of length were crudely established one Sunday morning in the 16th century at the decree of a king. The total length of the left feet of the first 16 men coming out of church was declared to be the lawful rod, and the sixteenth part of it was declared to be the lawful foot.

ICE CREAM
75¢ QT.
ALL FLAVORS
40¢ PT.

Changing to Other Units of Measure

Larger units to smaller; meaning [O]

1. One hot day in August, the Jackson Ice Cream Stand sold 43 gallons of ice cream. This was how many quarts?

The picture above shows 43 gallon containers against the wall and the picture on page 77 shows the quart containers needed for the same amount of ice cream. Each time you look at one of the gallon containers, *think*, "_?_ quarts." For 43 gallons there will be 43 of these 4's. 43 × 4, or 4 × 43, = ?

> **Because each larger unit of measure equals a fixed number of smaller units, we multiply to change from larger units to smaller units. The smaller the unit used, the greater is the number of units.**

[W]

Make these changes. Use page 71 if you need help.

2. 2 years to months
3. 8 tons to pounds
4. 5 lb. 4 oz. to ounces
5. 4 miles to feet
6. 7 bu. 3 pk. to pecks
7. 6 hr. 48 min. to minutes

8. Draw a number line to show Ex. 2.

Extra Practice. For more practice, work Set 35.

Smaller units to larger; meaning [O]

9. Suppose Ex. 1 had started this way: One hot day in August, the Jackson Ice Cream Stand sold 172 quarts of ice cream. This was how many gallons?

Whenever you look at 4 of the quart containers, you can *think*, "1 gallon." Then for every 4 of the 172 there will be 1 gallon. How can you find the number of 4's in 172? Study the work in the box. Explain what the quotient means.

$$\begin{array}{r} 43 \\ 4\overline{)172} \\ \underline{16} \\ 12 \\ \underline{12} \end{array}$$

Because a fixed number of smaller units of measure equals a larger unit, we divide to change from smaller units of measure to larger units. The larger the unit used, the smaller is the number of units.

[W]

Make these changes. Use page 71 if you need help.

10. 24 inches to feet

11. 48 months to years

12. 1,095 days to years

13. 300 pecks to bushels

14. 360 minutes to hours

15. 93 oz. to pounds and ounces

16. 80 ft. to yards and feet

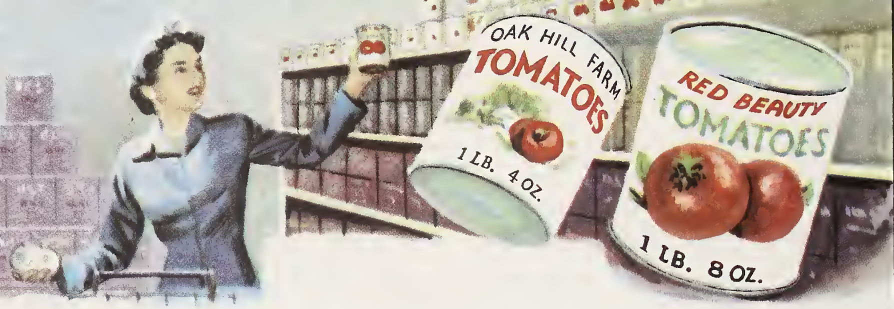
17. 24 da. to weeks and days

18. 72 qt. to gallons

19. 86 pt. to quarts

20. Draw a number line to show Ex. 10.

Extra Practice. For more practice, work Set 36.



Finding the Total

A. of denominate numbers [O]

1. Find the total weight of tomatoes Mrs. Hanes is buying.

In box A, adding ounces and pounds is somewhat like adding ones and _?_. Why do we not have to carry a 1 from the 12 ounces to the pound's column? Explain the addition.

A

$$\begin{array}{rr} 1 \text{ lb.} & 8 \text{ oz.} \\ +1 \text{ lb.} & 4 \text{ oz.} \\ \hline 2 \text{ lb.} & 12 \text{ oz.} \end{array}$$

2. Mrs. Hanes bought 2 lb. 6 oz. of ham and 1 lb. 12 oz. of steak. How much meat in all did Mrs. Hanes buy (box B)?

Work Ex. 2 at the board. *Think*, "6 oz. + 12 oz. = 18 oz. 18 oz. = 1 lb. 2 oz." You write "2 oz." in ounce's column and carry 1 (the 1 pound) to pound's column.

B

$$\begin{array}{rr} ^{1} & \\ 2 \text{ lb.} & 6 \text{ oz.} \\ +1 \text{ lb.} & 12 \text{ oz.} \\ \hline 4 \text{ lb.} & 2 \text{ oz.} \end{array}$$

Side work

16 oz. = 1 lb.,
so 18 oz. =
1 lb. 2 oz.

C

$$\begin{array}{rr} ^{1} & \\ 12 \text{ yr.} & 7 \text{ mo.} \\ +2 \text{ yr.} & 8 \text{ mo.} \\ \hline 15 \text{ yr.} & 3 \text{ mo.} \end{array}$$

Side work

12 mo. = 1 yr.,
so 15 mo. =
1 yr. 3 mo.

3. Sue is 12 yr. 7 mo. old. Kay is 2 yr. 8 mo. older. How old is Kay? Explain Ex. C. How could you check it?

[W]

Add. Think carefully about the carrying.

4. $\begin{array}{rr} 6 \text{ bu.} & 3 \text{ pk.} \\ +8 \text{ bu.} & 2 \text{ pk.} \\ \hline \end{array}$

5. $\begin{array}{rr} 5 \text{ gal.} & 2 \text{ qt.} \\ +7 \text{ gal.} & 3 \text{ qt.} \\ \hline \end{array}$

6. $\begin{array}{rr} 7 \text{ ft.} & 9 \text{ in.} \\ +5 \text{ ft.} & 6 \text{ in.} \\ \hline \end{array}$

Extra Practice. For more practice, work Set 33.

Finding the Remainder or Difference

S. of denominate numbers [O]

1. A can marked "1 lb. 4 oz." weighs how much less than one marked "1 lb. 8 oz."?

Explain the subtraction in box A.

A

1 lb. 8 oz.
−1 lb. 4 oz.
4 oz.

2. A book weighing 3 lb. 4 oz. is how much heavier than a book weighing 1 lb. 8 oz.?

In box B, can you subtract 8 oz. from 4 oz.? What do you borrow from 3 lb.? How is this different from borrowing a ten?

Explain all the work in box B.

B

2 lb. 20 oz.
~~3 lb.~~ ~~4 oz.~~
−1 lb. 8 oz.
1 lb. 12 oz.

Side work
Borrow 1 lb.,
or 16 oz.

4 oz.
+ 16 oz.
20 oz.

3. Today Sue played her violin for 50 min. Kay played the piano for 2 hr. 10 min. Kay has played how much longer than Sue?

In box C you borrow an hour and change it to _?_ min. Why?

Explain the subtraction in box C. Then explain how you would check the work.

C

1 hr. 70 min.
~~2 hr.~~ ~~10 min.~~
− 50 min.
1 hr. 20 min.

Side work
Borrow 1 hr.,
or 60 min.

10 min.
+60 min.
70 min.

[W]

Subtract. Think how many of the smaller units of measure there are in the 1 larger unit you have to borrow.

	a	b	c
4.	6 yd. 1 ft. −2 yd. 2 ft.	12 lb. 4 oz. −7 lb. 6 oz.	10 min. −3 min. 48 sec.
5.	1 gal. 1 qt. −3 qt.	5 T. 300 lb. −1,500 lb.	5 da. 2 hr. 12 min. −3 da. 5 hr. 30 min.

➤ **Extra Practice.** For more practice, work Set 34.

The Candy Counter at the Fair

M. of denominate numbers [O]

1. Each box of fudge weighs 2 lb. 6 oz. Mr. Cox is buying how much in 3 boxes?

3 × 2 lb. 6 oz. = ?

3 × 6 oz. = _?_ oz.

There are _?_ oz. in 1 lb., so 18 oz. = _?_ lb. _?_ oz.

2 lb. 6 oz.
×3
7 lb. 2 oz.

Side work
3 × 6 oz. = 18 oz.
18 oz. = 1 lb. 2 oz.

What do we write in ounce's column? What do we carry?

Multiply 2 lb. by 3 and add the 1 lb. carried. What do you write in the pound's column?

Why can you check the product by addition?

[W]

Multiply the following measuring numbers. You will need to think carefully about the carrying.

2. 3 qt. 1 pt. ×5
3. 5 gal. 3 qt. ×3
4. 5 ft. 7 in. ×6
5. 4 bu. 3 pk. ×9
6. 4 yd. 2 ft. ×8
7. 3 min. 40 sec. ×5
8. 4 hr. 30 min. ×6
9. 2 lb. 10 oz. ×7
10. 4 yd. 20 in. ×2

Extra Practice. For more practice, work Set 37.

Finding Equal Parts

D. of denominate numbers [O]

1. Bob raised 12 pk. 4 qt. of beans from his 4 rows. How much did each row average? $\frac{1}{4}$ of 12 pk. 4 qt. = ?

Box A: 12 pk. ÷ 4 = 3 pk. Write "3 pk." in peck's column.

4 qt. ÷ 4 = 1 qt. Write "1 qt." in quart's column. Now check.

A

$$\begin{array}{r} \text{3 pk. 1 qt.} \\ 4\overline{)\text{12 pk. 4 qt.}} \\ \underline{\text{12 pk.}\qquad} \\ \text{4 qt.} \\ \underline{\text{4 qt.}} \end{array}$$

Check

4 × 3 pk. 1 qt. = ?

2. A rope 4 yd. 2 ft. long is cut into 7 equal parts. How long is each part?

$\frac{1}{7}$ of 4 yd. 2 ft. = 4 yd. 2 ft. ÷ 7 (box B). Explain the work. Why was 4 yd. 2 ft. changed to 14 ft.?

B

$$7\overline{)\text{4 yd. 2 ft.}} = \begin{array}{r} \text{2 ft.} \\ 7\overline{)\text{14 ft.}} \\ \underline{\text{14 ft.}} \end{array}$$

Side work

1 yd. = 3 ft.

4 × 3 ft. = 12 ft.

12 ft. + 2 ft. = 14 ft.

3. $\frac{1}{5}$ of 13 ft. 4 in. = ? Explain the work in box C.

C

$$\begin{array}{rl} & \text{2 ft.} \qquad\qquad \text{8 in.} \\ 5\overline{)\text{13 ft. 4 in.}} & \\ \underline{\text{10 ft.}\qquad} & \\ \text{3 ft. 4 in.} & = \text{40 in.} \\ & \ \underline{\text{40 in.}} \end{array}$$

Side work

1 ft. = 12 in.

3 × 12 in. = 36 in.

36 in. + 4 in. = 40 in.

[W]

Copy, divide, and check.

	a	b	c
4.	$3\overline{)\text{6 ft. 9 in.}}$	$5\overline{)\text{10 lb. 15 oz.}}$	$6\overline{)\text{4 bu. 2 pk.}}$
5.	$8\overline{)\text{5 hr. 20 min.}}$	$3\overline{)\text{5 gal. 1 qt.}}$	$7\overline{)\text{3 T. 300 lb.}}$
6.	$6\overline{)\text{41 ft. 6 in.}}$	$2\overline{)\text{3 wk. 3 da.}}$	$4\overline{)\text{15 min. 36 sec.}}$

Extra Practice. For more practice, work Set 38.

McKay's
MUSTARD
3 lb. 8 oz
4 oz.
4 oz.
4 oz.

Dividing Measuring Numbers

[O]

1. How many 4-ounce jars can be filled from a can containing 3 lb. 8 oz. of mustard?

Why should you change 3 lb. 8 oz. to ounces before dividing?

Explain all the work in the box.

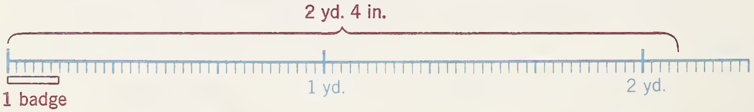
$$\begin{array}{r} 14 \\ 4\overline{)56} \\ \underline{4} \\ 16 \\ \underline{16} \end{array}$$

Side work

1 lb. = 16 oz.
3 × 16 oz. = 48 oz.
48 oz. + 8 oz. = 56 oz.

2. Find how many 6-inch badges you can cut from a ribbon 2 yd. 4 in. long.

Use the number line below to find the answer. Do you work with yards and inches or just with inches? Explain.



Are all 76 inches used up in making 12 badges? How many inches are left over? These extra inches are the remainder.

On the board, work the example with figures. Explain how you would check your work.

[W]

Divide the following:

3. $5\text{ in.}\overline{)4\text{ ft. }3\text{ in.}}$

4. $10\text{ min.}\overline{)1\text{ hr. }50\text{ min.}}$

5. $3\text{ qt.}\overline{)4\text{ gal. }2\text{ qt.}}$

6. $2\text{ qt.}\overline{)4\text{ pk. }7\text{ qt.}}$

7. $2\text{ in.}\overline{)1\text{ ft. }4\text{ in.}}$

8. $2\text{ min.}\overline{)1\text{ hr. }20\text{ min.}}$

Extra Practice. For more practice, work Set 39.

Finding n

The missing factor [O]

A

Multiplication

$$\underbrace{4 \times 8}_{\textit{factors}} = \underset{\overset{\uparrow}{\textit{product}}}{32}$$

B

Division

$$\underset{\overset{\nearrow}{\textit{dividend}}}{32} \div \underset{\overset{\uparrow}{\textit{divisor}}}{4} = \underset{\overset{\nwarrow}{\textit{quotient}}}{8}$$

1. In box A the factors are 4 and 8, the numbers that are multiplied together to give the product.

2. Although box B does not show multiplication, what two numbers can be multiplied together to get 32?

3. From box B, which two of these can be thought of as factors: dividend, divisor, quotient? Explain.

Finding Missing Factor in Multiplication and Division

C		D	
$n \times 8 = 32$	$4 \times n = 32$	$32 \div n = 8$	$32 \div 4 = n$
$n = 32 \div 8$	$n = 32 \div 4$	$n = 32 \div 8$	$n = 32 \div 4$
$n = 4$	$n = 8$	$n = 4$	$n = 8$

4. In the multiplication examples in box C, what is done each time to find **n**, the missing factor?

5. In the division examples in box D, what is done to find **n**, the missing divisor? **n**, the missing quotient?

6. Then in both multiplication and division, what must we do to find **n**, a missing factor?

[W]

Write your work to find **n**, the missing factor.

7. $n \times 9 = 72$
8. $45 \div n = 5$
9. $8 \times n = 48$
10. $95 \div 5 = n$
11. $27 \times n = 108$
12. $n \times 21 = 84$
13. $568 \div n = 8$
14. $n \times 8 = 136$
15. $100 \div 4 = n$

In a multiplication or a division example, we find the missing factor by dividing by the known factor.

Practice with Measuring Numbers

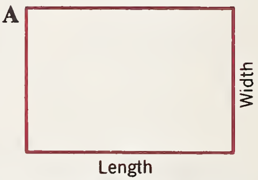
[W]

Add, subtract, multiply, or divide, as the signs tell you.

	a	b	c
1.	20 yd. 1 ft. −6 yd. 2 ft.	10 hr. 40 min. ×7	32 lb. 11 oz. +27 lb. 8 oz.
2.	15 gal. 2 qt. ×8	25 lb. 9 oz. −17 lb. 12 oz.	7 yd. 2 ft. 5 in. +3 yd. 2 ft. 7 in.
3.	2 pk. 7 qt. +6 qt.	7 T. 670 lb. ×6	13 wk. 4 da. −12 wk. 6 da.
4.	9)14 ft. 3 in.	5)3 gal. 1 pt.	3)4 T. 1,750 lb.

Perimeter and Area of a Rectangle

Meaning [O]



1. Diagram A is a **rectangle.** It has _?_ sides and _?_ square corners. Are all the sides the same length? Are any of the sides the same length? Check by measuring with your ruler.

2. Either of the long sides of a rectangle is called its **length,** and either of the short sides is called the **width.** The length of rectangle A is about _?_ in., and the width is about _?_ in. The length and the width of a rectangle are its **dimensions.**

3. "A rectangle 3 in. by 5 in." means a rectangle with the dimensions 3 in. and _?_ in. A shorter way to write this is: 3 in. × 5 in., or 3″ × 5″. The sign ″ means _?_.

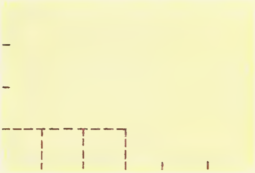
4. The distance around a rectangle is called its **perimeter.** Tell the perimeter of a rectangle 3″ × 5″. See if you can think of more than one way of finding the perimeter.

5. Are all squares rectangles? Are all rectangles squares? Tell how a square is different from other rectangles.

We often need to know not only the dimensions of a rectangle but also the amount of surface it contains, or its **area.** We measure area in area units just as we measure length in linear units. One unit of area is the **square inch (sq. in.)**, or the surface contained in a square with 1-inch sides. Is diagram B a square inch?

6. To find the area of a rectangle 4 in. × 6 in., Mike measured it with a square inch cut out of cardboard. On the board draw a rectangle with dimensions 4″ × 6″ and do what Mike did.

Mike measured with his square inch to find how many square inches there would be in a row along the long side of the rectangle. This diagram shows how he began. Finish the row in your diagram. One row contains _?_ sq. in.



Then Mike thought how many of these rows it would take to fill the whole rectangle. The rectangle is 4 inches wide, so there would be _?_ rows.

Mike multiplied 6 sq. in., the number of square inches in one row, by the number of rows, 4. 4 × 6 sq. in. = _?_ sq. in. The area of the rectangle is _?_ square inches.

7. In any rectangle, would there be as many square inches in one row as there are inches in the length? Would there always be as many rows as there are inches in the width?

To find the area of a rectangle, think of the number of area units in one row and then multiply by the number of rows.

[W]

Multiply to find the area of each of these rectangles. If you need help with any example, draw a diagram.

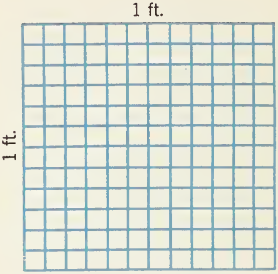
8. 2″ × 3″ **9.** 4″ × 5″ **10.** 3″ × 4″ **11.** 7″ × 10″

12. 3″ × 8″ **13.** 5″ × 13″ **14.** 9″ × 9″ **15.** 6″ × 15″

More Area Units

Square foot; square yard; acre **[O]**

Another area unit, 1 **square foot (sq. ft.)**, is a square with 1-foot sides.



1. Draw a square foot on the board and divide it into square inches as at the right.

2. There are _?_ sq. in. in one row. There are _?_ rows. Then in all there are 12 × 12 sq. in., or _?_ sq. in., in 1 sq. ft.

3. A **square yard (sq. yd.)** is a unit with each side 1 yard long. On the board, draw a square yard and divide it into square feet.

4. A square yard contains 3 × 3 sq. ft., or _?_ sq. ft. Explain how you know.

5. Look up and report to the class about how men used to measure an acre of land.

6. From the table at the foot of the page, tell which is larger, 1 acre or 1 square mile.

[W]

7. Find the area of **a.** a rug 6 ft. by 9 ft.; **b.** a floor 12′ by 15′ (the sign ′ means "foot" or "feet"); **c.** a card 5″ × 8″.

8. A desk 24 in. by 36 in. is _?_ sq. ft. in area. (Change 24 in. and 36 in. to feet before you multiply.)

9. A card table 36″ × 36″ is _?_ sq. ft. in area.

10. Find the area of a piece of carpet 3 yd. × 8 yd.

11. What is the area of a tennis court (a rectangle) 78′ × 36′?

12. Find the area of a football field (a rectangle) 360′ by 160′.

144 sq. in. = 1 sq. ft.
9 sq. ft. = 1 sq. yd.
43,560 sq. ft. = 1 acre (A.)
640 A. = 1 square mile (sq. mi.)

Finding Areas

Rectangles and squares [W]

Draw a picture to help you solve each problem.

1. Find the area of a piece of screening 6 feet by 2 feet.

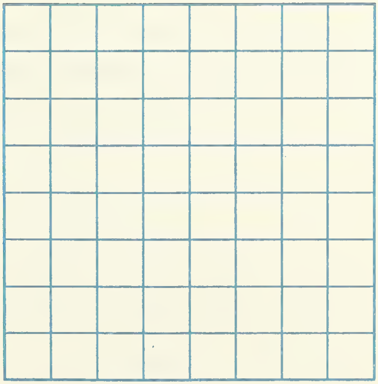
2. Jane's cookbook says that a cake may be baked either in a square pan 9 inches by 9 inches or in an oblong pan 8 inches by 12 inches. Which pan would make a cake of larger area?

3. Mr. Ordway figures that a quart of paint will cover about 100 square feet. Will he need more than 1 quart of paint for a porch floor that is 14 feet wide and 7 feet long?

4. Ann is taking a course in refinishing furniture. The catalog says, "Practise on a piece of your own furniture that takes floor space not more than 27 inches by 27 inches." Ann wants to work on a footstool that takes a floor space of 24 inches by 30 inches. Is this a smaller or a larger area than the catalog suggests?

5. Mrs. Walker bought a rubber pad 6 feet by 9 feet to put under a rug. The pad was priced by the square yard. How many square yards did Mrs. Walker buy?

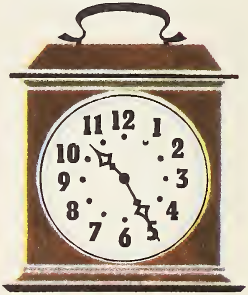
6. Ed planned to make a checkerboard for his mother's birthday gift. According to official rules, the board must be a square not less than 14 in. on a side nor more than 16 in., marked off into 64 smaller squares. Ed drew this plan for his board. Each small square was 2 in. on a side. How long was each side of the board? How many of the small squares were there in all? Did Ed's board fit the rules? Find the area of the board.



Units for the Measuring of Time

Minute, day, month, year, decade, century [O]

Everyone needs to know what time it is; that is, the year, the month, the day, the hour, the minute, and sometimes the second.



1. What year is this? What month?

2. What is the date today? What day of the week is it?

3. What time does this clock face show? Let's call this the right time now.

4. Using your answers for Ex. 1, 2, and 3 in one statement, tell the time at this minute.

We also may need to measure the length of time.

5. How can you tell how long it takes you to reach school from home?

6. How can you tell how long it is since Christmas?

7. How long ago did Columbus discover America?

8. What units for measuring time do we use in Ex. 5–7?

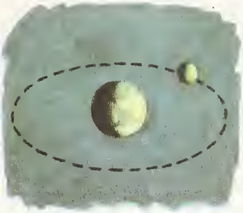
The chief time units are the day, the month, and the year.

The day. Think of a ball of yarn as the earth and the needle through its center as its axis. The earth turns on its axis from left to right, so the sun seems to move from east to west.

9. Show this with a ball and a needle.

A day is the length of time the earth takes for a full turn on its axis. Hours, minutes, and seconds are parts of the day, and a week is 7 times the length of a day.

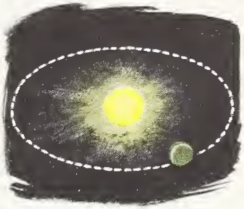
10. A day = _?_ minutes. 11. A week = _?_ hours.



The month. The moon goes around the earth once in about 30 days. The month is based on that fact.

12. Do all the months in our calendar have the same number of days? See if you can find out why they do not.

13. On the board, add the number of days in all 12 months. How many days in a common year?



The year. The earth goes around the sun, or *revolves* around it. The time of a full revolution is a year of 365 days. But the year is not really an exact number of times the moon-month or an exact number of times the earth-day. So, to give to our years the extra length they need, we have agreed that one year of every four shall be a leap year with an extra day in it.

14. Ten years are often called a **decade,** and 100 years, a **century.** A century contains how many decades?

[W]

15. Days, months, and years have names. Write the names of the days of the week.

16. Write the names of the months and their abbreviations.

17. Years are numbered. In what year were you born?

18. Which months have 30 days? which 31 days?

19. How many days has February?

By the moon,
1 mo. = about 30 da.

By agreement,
1 mo. = 31, 30, 29, or 28 da.
12 mo. = 1 yr.

By the sun,
1 yr. = about 365 da.

By agreement,
1 yr. = 365 or 366 da.
= 52 wk.
10 yr. = 1 decade
100 yr. = 1 century

The Calendar

Days, months, year [O]

1. Below is part of the calendar for a recent year. How many more months are left in the year?

2. Suppose today is Feb. 10. Find today on the calendar. What day of the week is it? A week later is what date?

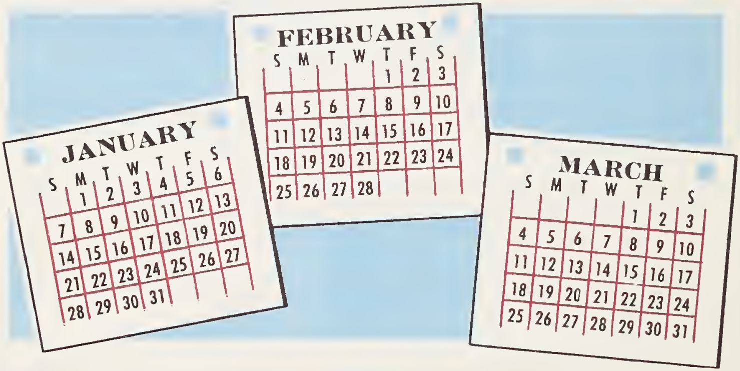
3. Why is the year of this calendar a **common year?**

[W]

4. Bob's birthday is Jan. 9, and Pat is 12 days younger than Bob. What is the date of Pat's birthday?

5. From Feb. 22 to Mar. 17 is how many weeks and days?

6. How many months is it from Mar. 15 to Sept. 15?



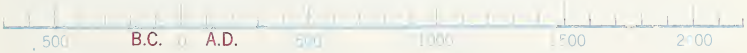
Years are numbered from the birth of Christ. Those since his birth are labeled A.D. (Anno Domini, which means "in the year of our Lord"). Those before his birth are labeled B.C. (before Christ). A year written without A.D. or B.C. is thought of as A.D. We write A.D. before the number of the year, and B.C. after it.

7. The Pilgrims landed at Plymouth Rock in 1620. Write the date with the correct label, A.D. or B.C.

The Landing of Columbus

Centuries on a number line [O]

1. The number line below (called a *time line*) indicates the centuries. The birth of Christ is at 0. Why?



2. The first century A.D. runs from 0 (at the beginning of the year 1) through the year 100. Point to that space.

3. Point to the space for the 15th century. It is from the beginning of 1401 through 1500.

4. The scene above took place in 1492, in the _?_ century.

5. What century are we in now? When did it begin? When will it end?

The number of hundreds in the last year of a century names the century.

[W]

6. Copy the above time line. On it, place these events:

a. Columbus landed, 1492
b. Lindbergh's birth, 1902
c. Fall of Rome, 476
d. Norman Conquest, 1066
e. Pilgrims landed, 1620
f. Battle of Marathon, 490 B.C.

Problems in Measurement

[W]

Write all your work.

1. Find the average number of days per month for the last 6 months of a calendar year.

2. For the last four days, it has taken Joe 11 min., 9 min., 10 min., and 12 min. to walk to school. What was his average?

3. On the average, Mr. Fox carries 2 T. of coal in his truck. How many trips will he make to carry 40 T.?

4. An eighth of a mile is sometimes called "a furlong." How many feet are there in a furlong?

5. A grocer puts 25 bu. of potatoes into 1-peck bags for sale. How many bags does he need?

6. How many quart bottles will 20 gal. of honey fill?

7. John bought 2 lb. 8 oz. of bacon, 12 oz. of dry cereal, and 1 lb. of cocoa. The three things weighed how much?

Extra Practice. For practice, work Set 40.

Do You Understand?

Test of Information and Meaning 2

1. How could you find the number of 32's in 725 without dividing?

2. When you find $\frac{1}{8}$ of 736, are you using measurement division or fractional-part division?

3. What table number helps you to find the quotient for $7\overline{)51}$? for $4\overline{)35}$? for $32\overline{)83}$?

4. If there are two partial dividends, how many quotient figures will there be?

5. If you divide tens, where will you write the quotient figure?

6. What is the largest quotient figure you can ever try?

7. How much more is 1 gallon than 1 quart?

8. In a rectangle 8′ by 5′, the numbers 8′ and 5′ are the _?_.

9. When we find the number of square units in a rectangle, we are finding its _?_.

10. How many square inches are there in 1 sq. ft.? How many square feet in 1 sq. yd.?

11. In what century is the year 1630? the year 1955?

12. Which months have 31 days?

Do You Make Mistakes?

Diagnostic Test 2

	a	b	c	Study Pages	Practice Sets
1.	$8\overline{)96}$	$5\overline{)278}$	$4\overline{)8{,}104}$	49-53	23, 24
2.	$60\overline{)240}$	$73\overline{)368}$	$56\overline{)170}$	58-59	25
3.	$38\overline{)190}$	$18\overline{)162}$	$39\overline{)275}$	60-62	26, 27
4.	$25\overline{)575}$	$47\overline{)\$39.95}$	$25\overline{)13{,}325}$	64-66	28-30
5.	$400\overline{)2{,}400}$	$395\overline{)10{,}275}$	$427\overline{)157{,}136}$	67-68	31
6.	6 ft. 3 in. +2 ft. 4 in.	8 lb. 5 oz. −4 lb. 10 oz.	3 gal. 2 qt. +5 gal. 3 qt.	78-79	33, 34
	a	b			
7.	4 yd. 2 ft. ×3	3 lb. 14 oz. ×4		80	37
8.	$5\overline{)8 \text{ hr. } 15 \text{ min.}}$	$2 \text{ ft.}\overline{)3 \text{ yd. } 1 \text{ ft.}}$		81, 82	38-40

Mixed Practice

[W]

Copy, and do as the signs say. Check your answers.

	a	b	c	d	e	f
1.	273 5,786 958 +675	8,963 3,826 859 +407	755 4,513 1,668 +268	3,806 7,712 59 +942	\$95.57 84.26 0.75 +4.65	\$63.07 5.73 98.95 +2.61
2.	768 −397	4,059 −2,673	20,061 −2,581	70,350 −3,876	\$73.42 −50.79	\$40.06 −2.79
3.	630 ×27	9,841 ×76	2,308 ×706	8,002 ×410	\$6.37 ×28	\$8.05 ×27

	a	b	c	d	e
4.	8)648	7)3,563	4)3,128	5)9,070	6)\$9.36
5.	7)4,692	9)\$18.27	60)3,600	43)\$20.64	193)38,041
6.	95)7,209	72)4,284	86)4,480	64)\$49.20	347)79,586

How Well Can You Figure?

Computation Test 2

	a	b	c	d
1.	6)78	8)179	5)1,580	80)640
2.	17)120	21)147	75)635	35)136
3.	46)\$34.50	700)4,900	128)9,600	625)53,750

4. 5 gal. 3 qt.
+2 gal. 1 qt.

5. 8 hr. 20 min.
−3 hr. 40 min.

6. 8 ft. 5 in.
×6

7. 4 bu. 3 pk.
×4

8. 5 oz.)3 lb. 2 oz.

9. $\frac{1}{4}$ of 7 wk. 3 da.

10. $\frac{1}{8}$ of 5 yd. 1 ft.

11. $\frac{1}{3}$ of 1 yr. 3 mo.

Can You Solve Problems?

Problem Test 2

1. On a city bus there is a mark on the door with the sign, "40 in., full fare." Jack is 3 ft. 6 in. tall. Would he have to pay full fare?

2. At $1.25 a square yard, find how much it would cost to have a 9′ by 12′ rug cleaned.

3. The Braves Baseball Club was organized in Boston in 1876. The Club transferred to Milwaukee in 1953. How long were the Braves in Boston?

4. The hardware store advertised 24-quart wastebaskets. How many pecks would such a wastebasket hold?

5. A farm magazine advertisement offered 10 extra chicks with every 100 chicks ordered. If Mr. Barr ordered 200 chicks at $15.40 per 100, what was the average cost per chick for the chicks he received?

6. An ordinary watch ticks 5 times a second, and a hall clock ticks 60 times a minute. Does the watch tick faster or more slowly than the clock?

7. A manufacturer claims that his pencil sharpener can sharpen 36,000 pencils before it gets dull. If 30 pencils are sharpened twice a day, in how many days may a new sharpener get dull?

8. How many years was it from 1492 to 1776? Draw a time line to show the centuries from the birth of Christ to the year 2000 and on it mark the approximate positions of the years 1492 and 1776.

9. How many gallons will a 12-quart pail hold?

10. Mrs. Walton paid 72¢ for a package of Canadian bacon which contained 24 slices. Allowing 3 slices per serving, find how much one serving of bacon cost.

3

UNITS OF MEASURE FOR COOKIN
3 TEASPOONS (TSP.) = 1 TABLESPOON (TBSP.)
16 TBSP. = 1 CUP (C.)
2½ C. = 1 PINT (PT.)
2 PT. = 1 QUART (QT.)
1 CUP
½ CUP
¼ CUP
REGAL
BAKI
POWD

Can You Use Cooking Measures?

Inventory Test 10 [O]

Wheat Muffins

- 2 c. flour
- $\frac{1}{2}$ tsp. salt
- 4 tsp. baking powder
- 3 tbsp. sugar
- 3 tbsp. butter
- 1 egg
- 1 c. milk

Loaf Cake

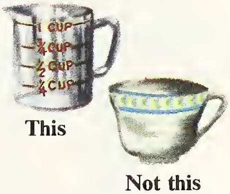
- $\frac{2}{3}$ c. sugar
- 1 c. milk
- 1 egg
- 3 tsp. baking powder
- 1 tsp. vanilla
- 2 c. flour
- 5 tbsp. butter
- $\frac{1}{2}$ tsp. salt

To help Cathy learn to use cooking measures correctly, her mother made the large table of measures shown on the opposite page.

1. Which units of measure will Cathy use in making the loaf cake?

Cathy uses a measuring cup, not a teacup. She also uses measuring spoons. She fills the spoons and the cup level full, not heaping.

2. Cathy has no tablespoon. How can she use a teaspoon to measure the sugar for the muffins? (1 tsp. = $\frac{1}{?}$ tbsp.)



3. On a measuring cup, the $\frac{3}{4}$ mark is higher than the $\frac{2}{3}$ mark. Then is $\frac{2}{3}$ c. of sugar more or less than $\frac{3}{4}$ c.?

4. The muffins take 3 tbsp. of butter and the cake takes 5 tbsp. So the muffins take $\frac{?}{?}$ as much butter as the cake.

5. What part of a cup is 3 tbsp.?

6. The 1 c. of milk for the cake is what part of a quart? of a pint?

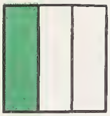
7. About how much more sugar does the cake need than the muffins?

8. Tell some other ways in which fractions are used.

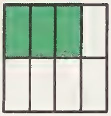
The Numbers Called Fractions

Meaning; writing fractions; terms of fraction [W]

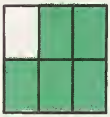
A



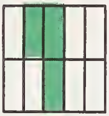
B



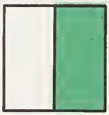
C



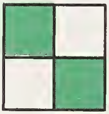
D



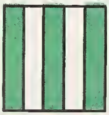
E



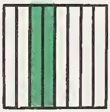
F



G



H



Squares A to H are the same size. Each of the squares is divided into equal parts.

1. On your paper write the letters, A, B, C, and so on, in a column. After your letter A write the number of equal parts in square A; after B, the number of equal parts in square B; and so on, to H.

2. Square A has 3 equal parts. Think of one of the parts—the one that is colored. What part of the square is this? Write your answer in words and in figures.

The **terms** of the fraction you wrote are 1 and 3. The names of the terms are given below:

$$\begin{array}{ll} 1 & \textit{numerator} \\ \cline{1-1} 3 & \textit{denominator} \end{array}$$

The **denominator** helps you think about the size of each equal part by showing you the number of equal parts in the whole square. The **numerator** tells you that you are to think about *one* of the three equal parts.

3. Think of 2 of the 3 equal parts of square A (the white part). Write in words and in figures the fraction that stands for this part of square A. Then write what the denominator and the numerator mean.

4. After B, C, D, and so on, write in words and in figures the fraction of each square that is colored and the fraction that is white.

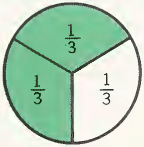
A fraction is a number which means one or more equal parts of a whole.

What Is a Fractional Unit?

Meaning; size [O]

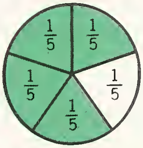
Just as we can think of a yard as being made up of 3 smaller units called feet or of a pound as being made up of 16 smaller units called ounces, we can think of any whole as being made up of a number of equal parts. We call the size of one of these equal parts the **fractional unit** for that whole thing. The fractional unit for circle A is $\frac{1}{3}$.

A



1. For each of circles B–D, tell what the fractional unit is and give the denominator of the fraction that names the fractional unit.

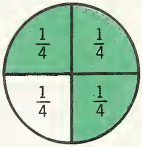
B



2. Circles A, B, C, and D are equal in size. Does the size of the fractional unit get larger or smaller as the denominator gets larger? Why?

3. In these equal circles, which is larger, $\frac{1}{3}$ or $\frac{1}{4}$? $\frac{1}{6}$ or $\frac{1}{5}$? $\frac{1}{5}$ or $\frac{1}{3}$? $\frac{1}{6}$ or $\frac{1}{4}$?

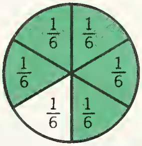
C



4. In circle A, 2 of the equal parts are green. We can think of the green part of circle A as two $\frac{1}{3}$'s, or $\frac{2}{3}$. What does the numerator, 2, tell?

5. In circle B, _?_ equal parts are green. What fraction tells how much of circle B is green? Which term of the fraction tells the number of equal parts that are green? Which term shows the size of the fractional unit?

D



6. In C, how many $\frac{1}{4}$'s in $\frac{3}{4}$? In D, how many $\frac{1}{6}$'s in $\frac{5}{6}$?

The denominator shows the size of the fractional unit, and the numerator tells the number of equal parts in the fraction.

[W]

7. For each of these fractions, write the fractional unit and the number of equal parts in the fraction: $\frac{4}{5}$; $\frac{2}{7}$; $\frac{7}{10}$; $\frac{1}{2}$; $\frac{9}{100}$.

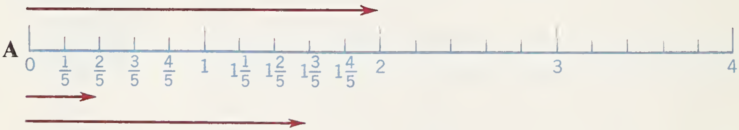
Fractions on a Number Line

Proper and improper fractions; mixed numbers **[O]**

A whole number, such as 6 or 52 or 1,280, tells how many wholes there are. Proper and improper fractions, such as $\frac{7}{8}$, $\frac{4}{5}$, and $\frac{5}{3}$, tell how many equal parts there are. So a mixed number, such as $2\frac{3}{4}$, is the sum of wholes and equal parts. $2\frac{3}{4} = 2 + \frac{3}{4}$.

1. Explain what these proper fractions mean: $\frac{3}{4}$, $\frac{2}{3}$, $\frac{7}{8}$, $\frac{11}{16}$; these improper fractions: $\frac{9}{4}$, $\frac{12}{7}$, $\frac{11}{6}$; these mixed numbers: $7\frac{9}{10}$, $8\frac{2}{3}$, $5\frac{1}{4}$.

Whole numbers, fractions, and mixed numbers may be shown on a number line like either A or B below. On line A, the fractions represented by the small divisions are fifths.

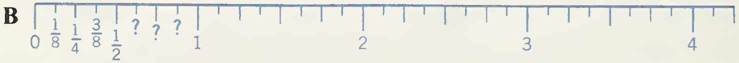


[W]

2. On line A, the whole number 2 stands for the distance from 0 to _?_. In the same way, the fraction _?_ stands for the distance from 0 to $\frac{2}{5}$. Which arrow shows this distance?

3. What mixed number stands for the distance shown by the second arrow under line A?

4. Copy line A as well as you can and under it show with arrows these distances: $\frac{4}{5}$; $2\frac{2}{5}$; 3.



5. Line B shows the edge of a ruler. With your ruler, draw a line like this. Label the equal parts of each inch.

6. Above your line B, show with arrows a distance of $\frac{7}{8}$ in.; of $1\frac{1}{4}$ in.; of $3\frac{5}{8}$ in. Label each arrow.

7. Below your line, show with an arrow the distance $2 + 1$; $\frac{1}{4} + \frac{3}{4}$; $1 + \frac{3}{8}$; $1\frac{1}{2} + 2\frac{1}{2}$.

Equal Parts of a Group

[O]

You have been thinking about equal parts of a single thing. You can also find equal parts of a group.

1. At Ann's birthday party, 4 of the 7 children are girls. What part of the group is girls?

Each girl is 1 of the 7 equal parts of the group, or $\frac{1}{7}$ of it. So 4 girls are _?_ $\frac{1}{7}$'s, or $\frac{4}{7}$, of the group at the party.

2. Two of the 5 apples in a basket are red. How many equal parts are red? What part of the apples is red? What part is not red?

[W]

Write answers for the following:

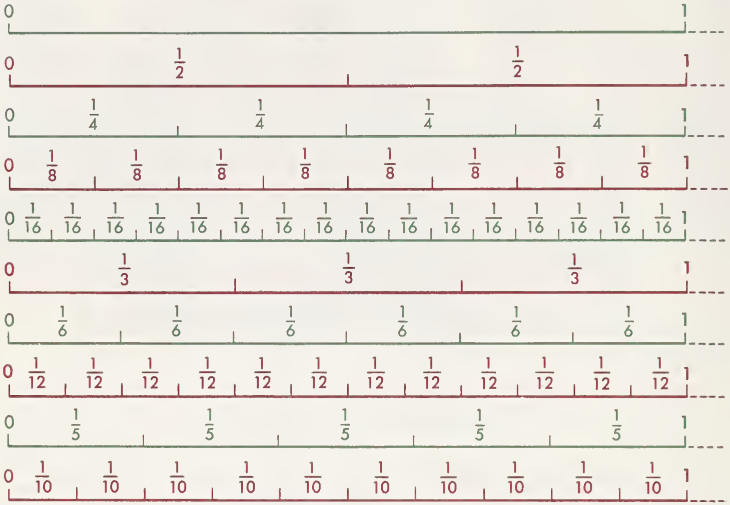
3. Jack has read 7 of the 12 pages of a story. What part of the story has he read?

4. Sue used 3 of her 10 stamps for mailing letters. What part of her stamps did she use?

5. Helen saved $5 of the $12 that she got for her birthday. What part of her money did she save?

6. Draw four bananas and color $\frac{3}{4}$ of them.

7. Draw nine candles and color $\frac{4}{9}$ of them.



Fractions We Use Often

Comparing fractions [O]

These number lines, picturing the distance from 0 to 1, show the fractions we use most often.

1. Find by counting on the second line how many $\frac{1}{2}$'s = 1.

2. Find how many $\frac{1}{8}$'s = 1.

3. How many $\frac{1}{10}$'s = 1?

4. $\frac{?}{5} = 1$

5. $\frac{3}{?} = 1$

6. $\frac{?}{12} = 1$

7. $\frac{4}{?} = 1$

A fraction equals 1 when the number of parts shown by the numerator equals the number of parts in the whole.

8. Using the number lines, tell which is more (longer):
a. $\frac{1}{3}$ or $\frac{1}{2}$; **b.** $\frac{1}{6}$ or $\frac{1}{5}$; **c.** $\frac{1}{10}$ or $\frac{1}{12}$; **d.** $\frac{3}{8}$ or $\frac{1}{4}$; **e.** $\frac{3}{10}$ or $\frac{1}{8}$.

9. By comparing lengths on the lines, find the missing numerators: $\frac{2}{8} = \frac{?}{4}$; $\frac{1}{2} = \frac{?}{6}$; $\frac{1}{3} = \frac{?}{12}$.

Name the largest and the smallest fraction in each group:

10. $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}$ 11. $\frac{1}{8}, \frac{1}{3}, \frac{1}{5}$ 12. $\frac{1}{16}, \frac{1}{10}, \frac{1}{12}$ 13. $\frac{1}{6}, \frac{1}{10}, \frac{1}{8}$

For each fraction below, use number lines on page 102 and find the missing numerator.

14. $\frac{1}{3} = \frac{?}{6}$ **15.** $\frac{3}{12} = \frac{?}{4}$ **16.** $\frac{2}{8} = \frac{?}{16}$ **17.** $\frac{4}{10} = \frac{?}{5}$

18. $\frac{6}{8} = \frac{?}{4}$ **19.** $\frac{6}{16} = \frac{?}{8}$ **20.** $\frac{9}{12} = \frac{?}{4}$ **21.** $\frac{3}{5} = \frac{?}{10}$

22. Now draw a long number line and divide it into 32ds. On the same line

a. show $\frac{1}{2}$'s with red division marks;
b. show $\frac{1}{4}$'s with green division marks;
c. show $\frac{1}{8}$'s with blue division marks;
d. show $\frac{1}{16}$'s with brown division marks.

23. Copy the following fractions and write the missing numerators. Use the line you drew for Ex. 22 to help you.

$\frac{1}{2} = \frac{?}{32}$; $\frac{1}{4} = \frac{?}{32}$; $\frac{1}{8} = \frac{?}{32}$; $\frac{1}{2} = \frac{?}{8}$; $\frac{3}{8} = \frac{?}{16}$; $\frac{6}{8} = \frac{?}{4}$.

Use the number lines on page 102 to help you find answers for the following:

24. Which of these fractions equal $\frac{1}{2}$?

$\frac{8}{16}$ $\frac{4}{12}$ $\frac{6}{10}$ $\frac{4}{8}$ $\frac{2}{3}$ $\frac{5}{10}$ $\frac{3}{6}$ $\frac{3}{4}$ $\frac{3}{5}$

25. Which of these fractions are less than $\frac{1}{2}$?

$\frac{1}{3}$ $\frac{2}{12}$ $\frac{4}{10}$ $\frac{3}{5}$ $\frac{5}{16}$ $\frac{1}{4}$ $\frac{3}{8}$ $\frac{5}{6}$ $\frac{5}{12}$

26. Which of these fractions are more than $\frac{1}{2}$?

$\frac{5}{6}$ $\frac{2}{3}$ $\frac{7}{16}$ $\frac{3}{4}$ $\frac{3}{10}$ $\frac{4}{5}$ $\frac{7}{8}$ $\frac{3}{12}$ $\frac{9}{16}$

27. Make a list of all fractions on the number lines equal to $\frac{1}{2}$.

28. Make another list of all fractions on the number lines which are less than $\frac{1}{2}$.

29. Make still another list of all fractions on the number lines which are greater than $\frac{1}{2}$.

30. Now make a list of all the fractions on the number lines which are equal to 1.

A Fraction May Mean Division

[O]

You have been thinking of the fractions $\frac{1}{4}$, $\frac{3}{8}$, $\frac{5}{6}$, $\frac{11}{5}$ and so on as numbers meaning one or more of the equal parts of something. But a fraction has other meanings too.

You know these two ways of writing a division example: $3\overline{)8}$ and $8 \div 3$. You could also write this example as the improper fraction $\frac{8}{3}$. Any fraction, proper or improper, may stand for a division. The fraction $\frac{3}{8}$ means $3 \div 8$. To see how this works, try to show by a diagram how 3 candy bars could be divided equally among 8 boys. Would each boy get $\frac{3}{8}$ of a bar?

So, depending on its use, $\frac{3}{8}$ may be

a. a number and mean 3 of the $\frac{1}{8}$'s of something; or

b. a division and mean that the dividend, 3, is to be divided by the divisor, 8.

1. Tell two meanings for each of these fractions:

$\frac{11}{8}$ $\frac{9}{7}$ $\frac{7}{10}$ $\frac{5}{9}$ $\frac{2}{3}$ $\frac{4}{5}$ $\frac{7}{4}$ $\frac{6}{6}$

A fraction may be a number and mean one or more equal parts; or it may stand for the division of the numerator by the denominator.

[W]

2. Write the following fractions:

a. the number meaning "seven $\frac{1}{8}$'s."
b. the division "9 divided by 4."
c. the division "5 divided by 6."
d. the number meaning "eight $\frac{1}{3}$'s."
e. the division "10 divided by 7."

3. Write four proper fractions, that is, fractions which have numerator smaller than denominator and mean less than 1.

4. Write four improper fractions, that is, fractions which have numerator equal to or greater than denominator and are equal to 1 or more than 1.

Showing a Remainder in a Fraction

Meaning [O]

A

$$\begin{array}{r} 2\frac{1}{4} \\ 4\overline{)9} \\ \underline{8} \\ 1 \end{array}$$

1. If 9 doughnuts were to be divided among 4 people, how many whole doughnuts would each of the 4 people have? also what part of a doughnut?

In box A, explain why the fraction, $\frac{1}{4}$, means that the 1 doughnut left over is divided among the 4 people.

Why would you not write the remainder, 1, in a fraction if you were dividing marbles?

B

$$\begin{array}{r} 10\frac{4}{5} \\ 5\overline{)54} \\ \underline{5} \\ 4 \end{array}$$

2. In box B, explain why the fraction $\frac{4}{5}$ is used beside the quotient, 10.

3. Make up a problem to fit the example in box B.

C

$$\begin{array}{r} 8,\ \text{R3} \\ 7\overline{)59} \\ \underline{56} \\ 3 \end{array}$$

D

$$\begin{array}{r} 8\frac{3}{7} \\ 7\overline{)59} \\ \underline{56} \\ 3 \end{array}$$

4–5. Boxes C and D show the work for 59 ÷ 7. Make a problem for Ex. C for which you would need to show the remainder with R. Make another problem for Ex. D in which you could show the remainder in a fraction which means division.

6. Make up a rule about when you can show the remainder in a fraction in a division example.

[W]

Work the following and write any remainder in a fraction.

	a	b	c	d	e
7.	$4\overline{)25}$	$3\overline{)23}$	$5\overline{)242}$	$6\overline{)929}$	$25\overline{)78}$
8.	$6\overline{)19}$	$7\overline{)45}$	$8\overline{)327}$	$4\overline{)763}$	$46\overline{)465}$
9.	$5\overline{)42}$	$4\overline{)19}$	$6\overline{)499}$	$9\overline{)578}$	$34\overline{)795}$
10.	$8\overline{)51}$	$6\overline{)35}$	$7\overline{)213}$	$8\overline{)989}$	$63\overline{)4{,}663}$
11.	$5\overline{)37}$	$9\overline{)65}$	$4\overline{)387}$	$3\overline{)769}$	$79\overline{)2{,}985}$

Changing the Form of a Fraction

[O]

1. From the number lines on page 102, you found that $\frac{6}{8} = \frac{3}{4}$; that is, six $\frac{1}{8}$'s = three $\frac{1}{4}$'s. You can quickly change $\frac{6}{8}$ to $\frac{3}{4}$ by dividing both the 6 and the 8 by _?_. $\frac{6 \div ?}{8 \div ?} = \frac{3}{4}$.

Change the fractions in Ex. 2–4 by dividing as in Ex. 1.

2. $\frac{6}{12} = \frac{?}{2}$ 3. $\frac{4}{12} = \frac{?}{3}$ 4. $\frac{6}{9} = \frac{?}{3}$

5. From the number lines, you found also that $\frac{1}{2} = \frac{4}{8}$; that is, one $\frac{1}{2}$ = four $\frac{1}{8}$'s. Without using the diagram, by what can you multiply both terms of $\frac{1}{2}$ to get $\frac{4}{8}$? $\frac{? \times 1}{? \times 2} = \frac{4}{8}$.

Change the fractions in Ex. 6–8 by multiplying as in Ex. 5.

6. $\frac{1}{4} = \frac{?}{16}$ 7. $\frac{3}{8} = \frac{?}{16}$ 8. $\frac{5}{6} = \frac{?}{12}$

The Golden Rule of Fractions is this: Multiplying or dividing both terms of a fraction by the same number does not change the value of the fraction.

Changing to higher terms

9. Study the work in box A. In this mixed number, the fraction has been changed to another fraction of the same value with a larger denominator and so with a smaller fractional unit. It has been changed **to higher terms.**

A

$2\frac{3}{4} = 2\frac{?}{20}$

$\frac{3}{4} = \frac{5 \times 3}{5 \times 4} = \frac{15}{20}$

$2\frac{3}{4} = 2\frac{15}{20}$

10. Why is $\frac{1}{20}$ a smaller fractional unit than $\frac{1}{4}$ even though the number 20 is larger than the number 4?

[W]

Change each fraction below to higher terms as required.

	a	b	c	d	e
11.	$\frac{3}{4} = \frac{?}{12}$	$\frac{5}{6} = \frac{?}{12}$	$\frac{4}{5} = \frac{?}{10}$	$\frac{1}{4} = \frac{?}{16}$	$\frac{1}{3} = \frac{?}{6}$
12.	$\frac{1}{6} = \frac{?}{18}$	$\frac{2}{3} = \frac{?}{9}$	$\frac{5}{8} = \frac{?}{24}$	$\frac{5}{8} = \frac{?}{16}$	$\frac{3}{5} = \frac{?}{20}$
13.	$3\frac{2}{3} = 3\frac{?}{6}$	$1\frac{3}{8} = 1\frac{?}{16}$	$2\frac{3}{11} = 2\frac{?}{22}$	$3\frac{1}{7} = 3\frac{?}{14}$	$6\frac{2}{9} = 6\frac{?}{18}$

Changing to lowest terms [O]

14. Three players are what part of a ball team of 9 players?

One boy is $\frac{1}{9}$ of the team, so 3 boys are $\frac{3}{9}$. By the Golden Rule,

$$\frac{3 \div 3}{9 \div 3} = \frac{1}{3}.$$

This is reducing $\frac{3}{9}$ **to lower terms.**

15. At Sue's party, 18 out of 24 cookies were eaten. Why can you say that $\frac{18}{24}$ were eaten?

16. In box B, $\frac{18}{24}$ is reduced first to $\frac{9}{12}$, but $\frac{9}{12}$ is still not the best form. Why?

17. When $\frac{9}{12}$ is reduced to $\frac{3}{4}$, is the fraction $\frac{3}{4}$ in lowest terms? HELPER: Can both terms of $\frac{3}{4}$ be divided by any number other than 1?

18. In box C, we divide both terms of $\frac{18}{24}$ by 6 and get $\frac{?}{?}$ at once. Why is this better than dividing first by 2 and then by 3?

B

$$\frac{18}{24} = \frac{?}{?}$$

$$\frac{18 \div 2}{24 \div 2} = \frac{9}{12}$$

$$\frac{9 \div 3}{12 \div 3} = \frac{3}{4}$$

C

$$\frac{18 \div 6}{24 \div 6} = \frac{3}{4}$$

To be in best form, fractions in answers should be in lowest terms.

A fraction is in lowest terms when no number except 1 will exactly divide both its terms.

[W]

Reduce to best form if fraction not already in lowest terms.

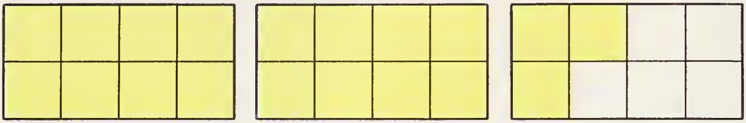
	a	b	c	d	e	f
19.	$\frac{4}{6}$	$\frac{3}{9}$	$\frac{10}{12}$	$\frac{3}{12}$	$\frac{4}{7}$	$8\frac{8}{16}$
20.	$\frac{7}{14}$	$\frac{10}{15}$	$\frac{8}{12}$	$\frac{7}{10}$	$\frac{8}{24}$	$\frac{4}{20}$
21.	$\frac{6}{18}$	$\frac{5}{12}$	$\frac{6}{20}$	$\frac{8}{18}$	$\frac{15}{24}$	$\frac{7}{28}$
22.	$2\frac{6}{10}$	$5\frac{4}{8}$	$8\frac{1}{3}$	$7\frac{8}{20}$	$4\frac{9}{12}$	$1\frac{6}{24}$

➤ **Extra Practice.** Work Sets 32 and 41.

Changing Improper Fractions to Best Form

[O]

1. If there are 19 people at Jack's Halloween party and each of the 19 people is served $\frac{1}{8}$ of a cake, how much cake will be eaten?



In the drawing of the 3 cakes, the colored pieces are the $\frac{1}{8}$'s to be served. Count to see how many $\frac{1}{8}$'s are colored.

Without counting the $\frac{1}{8}$'s in the picture, tell how many $\frac{1}{8}$'s there are in 1 cake; in 2 cakes. Then how many $\frac{1}{8}$'s will be eaten from the third cake to make $\frac{19}{8}$?

How can you tell from the drawing that $\frac{19}{8}$ cakes and $2\frac{3}{8}$ cakes are the same? What kind of fraction is $\frac{19}{8}$? What kind of number is $2\frac{3}{8}$? The improper fraction $\frac{19}{8}$ is in best form when it is changed to the mixed number $2\frac{3}{8}$.

2. If only 16 people are at the party, $\frac{?}{8}$, or 2 cakes, will be eaten. Is 2 a whole number? Why is $\frac{16}{8}$ an improper fraction? The improper fraction $\frac{16}{8}$ is in best form when it is changed to a whole number.

3. We usually change an improper fraction to best form by using figures instead of drawings.

To find how many wholes, (that is, how many $\frac{8}{8}$'s) and how many extra $\frac{1}{8}$'s there are in $\frac{19}{8}$, *think*, "$\frac{8}{8} = 1$ whole, $\frac{16}{8} = 2$ wholes. Then in $\frac{19}{8}$ there are 2 wholes and $\frac{3}{8}$ more, or $2\frac{3}{8}$." $\frac{19}{8} = ?$

$\frac{19}{8} = ?$
$\frac{8}{8} = 1$ whole
$\frac{16}{8} = 2$ wholes
$\frac{19}{8} = 2 + \frac{3}{8}$

You know that $\frac{19}{8}$ means $19 \div 8$. Then a quick way to change the fraction to best form is to do the division, writing the remainder in a fraction. $19 \div 8 = 2\frac{?}{8}$.

4. Change the fraction $\frac{22}{4}$ to a mixed number. $22 \div 4 = ?$ In the box, why is $5\frac{2}{4}$ changed to $5\frac{1}{2}$?

$$\boxed{\frac{22}{4} = 4\overline{)22} = 5\frac{2}{4} = 5\frac{1}{2}}$$

To change an improper fraction to a whole or a mixed number, divide the numerator of the fraction by the denominator.

Answers are in best form when improper fractions have been changed to whole or mixed numbers and when proper fractions are in lowest terms.

[W]

Change to best form:

	a	b	c	d	e	f	g	h
5.	$\frac{15}{8}$	$\frac{12}{4}$	$\frac{17}{6}$	$\frac{5}{5}$	$\frac{24}{6}$	$\frac{222}{3}$	$\frac{26}{7}$	$\frac{42}{5}$
6.	$\frac{9}{9}$	$\frac{32}{6}$	$\frac{45}{8}$	$\frac{30}{6}$	$\frac{28}{8}$	$\frac{31}{9}$	$\frac{25}{5}$	$\frac{27}{6}$

Extra Practice. Work Set 42.

Oral Exercises

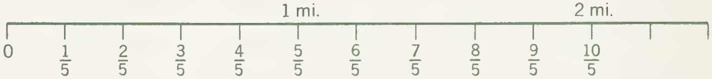
Review of meanings

1. Change to best form: $\frac{22}{6}$; $\frac{16}{4}$; $\frac{19}{5}$; $3\frac{4}{12}$.
2. What part of an hour is 45 min.?
3. What fraction means 7 of the $\frac{1}{10}$'s of a circle?
4. Is $\frac{3}{8}$ more or less than $\frac{1}{2}$?
5. What does the number below the fraction line tell?
6. Give three fractions which are equal to $\frac{3}{4}$.
7. What is the fractional unit of $\frac{7}{8}$? $\frac{5}{6}$? $\frac{2}{3}$? $\frac{11}{12}$? $\frac{3}{4}$?
8. Why does $\frac{3}{12} = \frac{1}{4}$?
9. What number contains 59 thousands, 1 hundred, 7 ones?
10. What is the missing numerator? $\frac{7}{8} = \frac{?}{32}$
11. When would $\frac{1}{3}$ be larger than $\frac{1}{2}$?
12. In the number 5,042 there are _?_ tens in all.

Adding and Subtracting Like-Fractions

[O]

1. Carl walks $\frac{2}{5}$ mi. to the school-bus stop. Then he rides $\frac{4}{5}$ mi. in the bus. How far does he go on his way to school?



Find the answer for Ex. 1 by using the number line above.

Why do you know that $\frac{2}{5}$ and $\frac{4}{5}$ are like-fractions? HELPER. Do they have the same fractional unit?

In box A, two $\frac{1}{5}$'s plus four $\frac{1}{5}$'s = _?_ $\frac{1}{5}$'s. Why is $\frac{6}{5}$ changed to $1\frac{1}{5}$?

A

$$\begin{array}{r} \frac{2}{5} \\ +\frac{4}{5} \\ \hline \frac{6}{5} = 1\frac{1}{5} \end{array}$$

2. Jane rides $\frac{7}{8}$ mi. and Sue $\frac{5}{8}$ mi. in the school bus. How much farther does Jane ride than Sue?

Find the answer by using your ruler as the number line.

In box B, explain the subtraction. Why is $\frac{2}{8}$ changed to $\frac{1}{4}$?

B

$$\begin{array}{r} \frac{7}{8} \\ -\frac{5}{8} \\ \hline \frac{2}{8} = \frac{1}{4} \end{array}$$

We can add or subtract like-fractions, that is, fractions with the same fractional unit.

The numerators tell how many equal parts are to be added or subtracted. The denominators show the size of the fractional unit.

[W]

Copy and add or subtract. Give answers in best form.

3. $\begin{array}{r}\frac{1}{3}\\+\frac{2}{3}\\\hline\end{array}$ $\begin{array}{r}\frac{1}{6}\\+\frac{5}{6}\\\hline\end{array}$ $\begin{array}{r}\frac{7}{8}\\+\frac{5}{8}\\\hline\end{array}$ $\begin{array}{r}\frac{3}{5}\\+\frac{1}{5}\\\hline\end{array}$ $\begin{array}{r}\frac{1}{2}\\+\frac{1}{2}\\\hline\end{array}$ $\begin{array}{r}\frac{3}{10}\\+\frac{9}{10}\\\hline\end{array}$ $\begin{array}{r}\frac{5}{9}\\+\frac{7}{9}\\\hline\end{array}$ $\begin{array}{r}\frac{3}{4}\\+\frac{3}{4}\\\hline\end{array}$

4. $\begin{array}{r}\frac{5}{16}\\\frac{3}{16}\\+\frac{7}{16}\\\hline\end{array}$ $\begin{array}{r}\frac{6}{7}\\\frac{5}{7}\\+\frac{2}{7}\\\hline\end{array}$ $\begin{array}{r}\frac{5}{12}\\\frac{7}{12}\\+\frac{1}{12}\\\hline\end{array}$ $\begin{array}{r}\frac{5}{6}\\\frac{5}{6}\\+\frac{1}{6}\\\hline\end{array}$ $\begin{array}{r}\frac{3}{8}\\\frac{5}{8}\\+\frac{7}{8}\\\hline\end{array}$ $\begin{array}{r}\frac{2}{15}\\\frac{1}{15}\\+\frac{2}{15}\\\hline\end{array}$ $\begin{array}{r}\frac{11}{12}\\\frac{1}{12}\\+\frac{7}{12}\\\hline\end{array}$ $\begin{array}{r}\frac{7}{10}\\\frac{3}{10}\\+\frac{9}{10}\\\hline\end{array}$

5. $\begin{array}{r}\frac{5}{8}\\-\frac{1}{8}\\\hline\end{array}$ $\begin{array}{r}\frac{4}{5}\\-\frac{2}{5}\\\hline\end{array}$ $\begin{array}{r}\frac{9}{10}\\-\frac{7}{10}\\\hline\end{array}$ $\begin{array}{r}\frac{7}{8}\\-\frac{3}{8}\\\hline\end{array}$ $\begin{array}{r}\frac{7}{12}\\-\frac{5}{12}\\\hline\end{array}$ $\begin{array}{r}\frac{7}{10}\\-\frac{3}{10}\\\hline\end{array}$ $\begin{array}{r}\frac{7}{9}\\-\frac{4}{9}\\\hline\end{array}$ $\begin{array}{r}\frac{7}{16}\\-\frac{3}{16}\\\hline\end{array}$

6. $\begin{array}{r}\frac{3}{8}\\-\frac{1}{8}\\\hline\end{array}$ $\begin{array}{r}\frac{2}{3}\\-\frac{1}{3}\\\hline\end{array}$ $\begin{array}{r}\frac{6}{7}\\-\frac{2}{7}\\\hline\end{array}$ $\begin{array}{r}\frac{9}{10}\\-\frac{7}{10}\\\hline\end{array}$ $\begin{array}{r}\frac{5}{12}\\-\frac{1}{12}\\\hline\end{array}$ $\begin{array}{r}\frac{9}{11}\\-\frac{3}{11}\\\hline\end{array}$ $\begin{array}{r}\frac{5}{6}\\-\frac{1}{6}\\\hline\end{array}$ $\begin{array}{r}\frac{15}{16}\\-\frac{9}{16}\\\hline\end{array}$

Work Ex. 7–11. Give your answers in best form. Then prove each answer by drawing a number line and using it.

7. Sam and Tom started for the ball game at the same time. Sam arrived in $\frac{1}{4}$ hr. but Tom needed $\frac{3}{4}$ hr. How much longer did it take Tom than it took Sam?

8. Betty bought $\frac{3}{8}$ lb. of chocolate peppermints, and Sue bought $\frac{7}{8}$ lb. How much candy did they buy in all?

9. Lois had $\frac{7}{12}$ dozen candy pumpkins, Janet had $\frac{5}{12}$ dozen, and Barbara had $\frac{11}{12}$ dozen. How many dozen candy pumpkins did these girls have together?

10. Bob's fish weighed $\frac{15}{16}$ pound and John's, $\frac{7}{16}$ pound. How much more did Bob's fish weigh than John's?

11. Jane walked downtown in $\frac{3}{10}$ hr., spent $\frac{7}{10}$ hr. shopping, and rode home with her father in $\frac{1}{10}$ hr. How much time did the whole trip take?

▶ **Extra Practice.** For more practice with fractions, work Sets 43 and 44.

Adding Mixed Numbers

Without and with carrying [O]

1. Jean had $1\frac{5}{8}$ yd. of ribbon and bought $2\frac{1}{8}$ yd. more. How much ribbon did she have then?

$1\frac{5}{8}$ means $1 + \frac{5}{8}$. What does $2\frac{1}{8}$ mean?

We are to find $1 + \frac{5}{8} + 2 + \frac{1}{8}$. Why can we write this "$1 + 2 + \frac{5}{8} + \frac{1}{8}$"?

Box A shows how you can write these mixed numbers to add first the fractions and then the whole numbers. Explain. Check by adding upward.

Why was $3\frac{6}{8}$ changed to $3\frac{3}{4}$?

A

$$\begin{array}{r} 1\frac{5}{8} \\ \underline{+2\frac{1}{8}} \\ 3\frac{6}{8} = 3\frac{3}{4} \end{array}$$

2. On the board find the sum of $3 + \frac{3}{8} + 2\frac{1}{8}$.

3. Tom sold two chickens. One of them weighed $4\frac{3}{4}$ lb. and the other $3\frac{3}{4}$ lb. What was the total weight of the chickens?

In box B, how do we get $7\frac{6}{4}$?

B

$$\begin{array}{r} 4\frac{3}{4} \\ \underline{+3\frac{3}{4}} \\ 7\frac{6}{4} = 8\frac{1}{2} \end{array}$$

Side work

$\frac{6}{4} = 1\frac{2}{4}$, or $1\frac{1}{2}$

$7\frac{6}{4} = 7 + 1\frac{1}{2}$, or $8\frac{1}{2}$

Explain the side work. How is this like carrying?

4. On the board find the sum of $3\frac{3}{5} + \frac{4}{5} + 2\frac{3}{5}$.

[W]

Copy and add downward. Check by adding upward.

	a	b	c	d	e	f	g
5.	$6\frac{5}{8}$ $+3$	1 $+2\frac{1}{4}$	$3\frac{5}{6}$ $+4$	$3\frac{2}{3}$ $+5\frac{2}{3}$	$1\frac{1}{2}$ $+\frac{1}{2}$	$2\frac{7}{10}$ $+2\frac{9}{10}$	$3\frac{2}{5}$ $+1\frac{3}{5}$
6.	$6\frac{2}{7}$ $\frac{6}{7}$ $+3$	$3\frac{5}{6}$ $1\frac{5}{6}$ $+\frac{1}{6}$	$4\frac{2}{9}$ $3\frac{5}{9}$ $+1\frac{8}{9}$	$3\frac{5}{16}$ 7 $+4\frac{3}{16}$	$\frac{3}{10}$ $1\frac{1}{10}$ $+2\frac{7}{10}$	$2\frac{1}{12}$ $3\frac{5}{12}$ $+1\frac{11}{12}$	6 $1\frac{1}{4}$ $+2\frac{1}{4}$

➤ **Extra Practice.** For more practice, work Set 45.

Subtracting Mixed Numbers

Without and with borrowing [O]

A

$$\begin{array}{r} 6\frac{3}{4} \\ -4\frac{1}{4} \\ \hline 2\frac{2}{4} = 2\frac{1}{2} \end{array}$$

1. Ray dug $6\frac{3}{4}$ bu. of potatoes and sold $4\frac{1}{4}$ bu. of them. How many bushels were left?

Explain the work in box A, subtracting first the fractions, then the whole numbers.

Why was the answer changed to $2\frac{1}{2}$?

How could you check the answer?

B

$$\begin{array}{rcr} 9 & = & 8\frac{10}{10} \\ -6\frac{7}{10} & = & 6\frac{7}{10} \\ \hline & & 2\frac{3}{10} \end{array}$$

2. Mr. Lee has driven $6\frac{7}{10}$ mi. of the 9 mi. to town. How much farther must he drive?

In $9 - 6\frac{7}{10}$ (box B), there are no $\frac{1}{10}$'s from which to take $\frac{7}{10}$. Why can we borrow 1 whole, changing 9 to $8\frac{10}{10}$?

Explain the subtracting in box B.

C

$$\begin{array}{rcr} 6\frac{1}{8} & = & 5\frac{9}{8} \\ -2\frac{7}{8} & = & 2\frac{7}{8} \\ \hline & & 3\frac{2}{8} = 3\frac{1}{4} \end{array}$$

3. From a cheese weighing $6\frac{1}{8}$ lb., Mr. West, the grocer, has cut $2\frac{7}{8}$ lb. How much is left?

In $6\frac{1}{8} - 2\frac{7}{8}$ (box C), $\frac{7}{8}$ cannot be taken from $\frac{1}{8}$. So we must borrow 1 from 6, change that 1 to $\frac{8}{8}$, and add it to the $\frac{1}{8}$, making $\frac{?}{8}$.

Explain all the subtracting in box C.

4. On the board find the remainder for $6 - \frac{3}{4}$.

[W]

Copy and subtract. Check by adding.

	a	b	c	d	e	f	g
5.	$\begin{array}{r} 8\frac{3}{5} \\ -2\frac{1}{5} \\ \hline \end{array}$	$\begin{array}{r} 4\frac{2}{3} \\ -1 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ -3\frac{1}{6} \\ \hline \end{array}$	$\begin{array}{r} 3\frac{3}{10} \\ -1\frac{7}{10} \\ \hline \end{array}$	$\begin{array}{r} 2 \\ -\frac{4}{7} \\ \hline \end{array}$	$\begin{array}{r} 10 \\ -\frac{4}{5} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{1}{4} \\ -5\frac{3}{4} \\ \hline \end{array}$
6.	$\begin{array}{r} 6\frac{1}{3} \\ -2\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{4}{7} \\ -1\frac{5}{7} \\ \hline \end{array}$	$\begin{array}{r} 10 \\ -5\frac{1}{2} \\ \hline \end{array}$	$\begin{array}{r} 8\frac{1}{6} \\ -\frac{5}{6} \\ \hline \end{array}$	$\begin{array}{r} 2\frac{7}{10} \\ -\frac{7}{10} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{3}{16} \\ -1\frac{7}{16} \\ \hline \end{array}$	$\begin{array}{r} 3\frac{7}{20} \\ -\frac{9}{20} \\ \hline \end{array}$

➤ **Extra Practice.** For more practice, work Set 46.

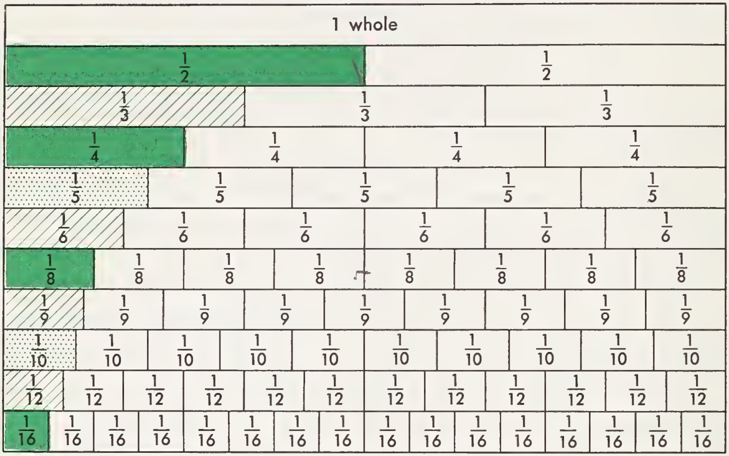
Write three problems using the numbers in Ex. 5a to 5c.

What Is a Common Denominator?

Meaning [O]

Judy and Mary are both 12 years old, so we say that 12 is their *common* age, that is, the age they both have.

1. What is the common fractional unit for the fractions $\frac{5}{12}$ and $\frac{7}{12}$? What is their **common denominator**?



2. To find a common denominator for $\frac{1}{2}$ and $\frac{3}{8}$, use the chart above. Lay your ruler so that it runs straight down the chart from the $\frac{1}{2}$ point. Then look down to the bar divided into $\frac{1}{8}$'s. How many $\frac{1}{8}$'s does it take to equal exactly $\frac{1}{2}$? $\frac{1}{2} = \frac{?}{8}$.

3. When we write $\frac{1}{2}$ and $\frac{3}{8}$ as $\frac{4}{8}$ and $\frac{3}{8}$, what common fractional unit do we show? What is the common denominator?

4. Use the chart to find five other ways in which $\frac{1}{2}$ can be changed. $\frac{1}{2} = \frac{?}{4}$; $\frac{1}{2} = \frac{?}{6}$; and so on.

Fractions which have a common fractional unit have a common denominator.

You do not need the chart if you know the Golden Rule of Fractions. You can use this rule to help you change any set of fractions into fractions with a common denominator.

5. Look again at the fractions $\frac{1}{2}$ and $\frac{3}{8}$. Can you reduce $\frac{3}{8}$ to halves? Can 2 be a common denominator? Can $\frac{1}{2}$ be changed to eighths? Can 8 be a common denominator? By what will you multiply both terms of $\frac{1}{2}$ to change it to eighths? $\frac{1}{2} = \frac{?}{8}$.

6. The fractions $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{7}{16}$ can have what number as a common denominator? Explain how you would change $\frac{1}{2}$ and $\frac{3}{4}$ to sixteenths by the Golden Rule of Fractions.

[W]

Use the chart and write these pairs of fractions so that each pair will have a common denominator. (HELPER. Always change to a smaller fractional unit.)

7. $\frac{1}{2}$ and $\frac{3}{4}$ 8. $\frac{3}{8}$ and $\frac{5}{16}$ 9. $\frac{7}{8}$ and $\frac{11}{16}$ 10. $\frac{1}{3}$ and $\frac{5}{12}$

Use the Golden Rule of Fractions and write these pairs of fractions so that each pair will have a common denominator:

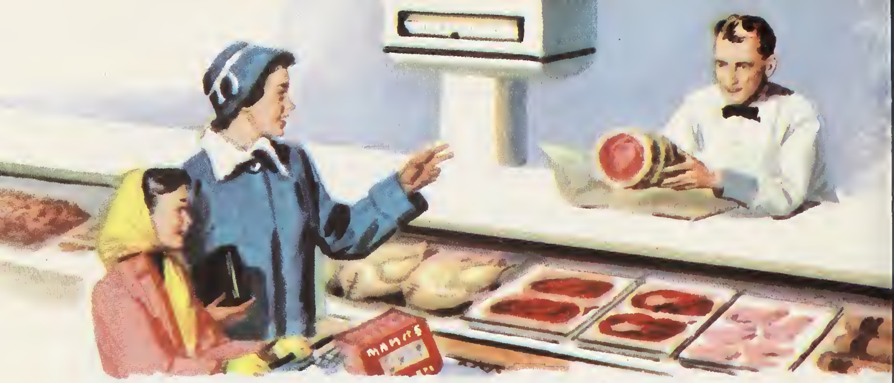
11. $\frac{1}{4}$ and $\frac{7}{8}$ 12. $\frac{5}{6}$ and $\frac{11}{12}$ 13. $\frac{4}{5}$ and $\frac{7}{10}$ 14. $\frac{3}{4}$ and $\frac{9}{16}$

To Keep in Practice

Whole numbers [W]

Do what the signs tell you to do. Check your work. In the division examples, write any remainder in a fraction.

	a	b	c	d	e	f
1.	59 87 92 +64	60 97 13 +48	542 638 929 +628	3,641 297 78 +5,467	$91.25 3.76 46.27 +0.96	$84.69 27.93 6.38 +4.94
2.	871 −463	964 −371	4,100 −1,628	2,060 −782	$81.00 −36.54	$90.00 −6.37
3.	63 ×59	76 ×47	290 ×604	8,006 ×354	$40.60 ×298	$32.27 ×68
4.	42)966	36)884	68)380	18)1,338	36)$9.36	27)$8.37



At the Market

A. and S. of unlike-fractions; common denominator present [O]

1. At the market, Ann's mother bought $\frac{1}{2}$ lb. of bacon and $\frac{3}{4}$ lb. of sliced ham. How much did the meat weigh in all?

Since both $\frac{1}{2}$ and $\frac{3}{4}$ are parts of a pound, can we add these fractions? First we must change one of them so that they will have a common fractional unit. In box A, $\frac{1}{2}$ is changed to $\frac{?}{4}$. 2 fourths + 3 fourths = _?_ fourths.

Now explain all the work in box A.

A

$$\begin{array}{rcl} \frac{1}{2} & = & \frac{2}{4} \\ +\frac{3}{4} & = & \frac{3}{4} \\ \hline & & \frac{5}{4} = 1\frac{1}{4} \end{array}$$

2. The roast that the butcher showed Ann's mother weighed $7\frac{5}{8}$ lb. This was more than she wanted, so he cut off a piece. Then the roast weighed $5\frac{1}{2}$ lb. How much was cut off?

What common denominator should the fractions have?

By what can you multiply both terms of the fraction $\frac{1}{2}$ to change $\frac{1}{2}$ to eighths? $\frac{1}{2}=\frac{?}{8}$

Explain the work in box B.

B

$$\begin{array}{rcl} 7\frac{5}{8} & = & 7\frac{5}{8} \\ -5\frac{1}{2} & = & 5\frac{4}{8} \\ \hline & & 2\frac{1}{8} \end{array}$$

Unlike-fractions cannot be added or subtracted until some change is made so that they have a common denominator.

Tell the common denominator to be used in each of Ex. 3–6.

3. $\frac{1}{3}+\frac{1}{6}=?$ 4. $\frac{3}{10}+\frac{1}{5}=?$ 5. $2\frac{1}{4}-\frac{1}{8}=?$ 6. $1\frac{5}{6}-\frac{1}{3}=?$

No carrying or borrowing [W]

Copy and add. First *think*, "What should be the common denominator?" Check by adding upward.

	a	b	c	d	e	f	g
7.	$\frac{4}{5}$ $+\frac{9}{10}$	$\frac{7}{8}$ $+\frac{1}{2}$	$4\frac{1}{2}$ $+2\frac{1}{4}$	$\frac{3}{10}$ $+1\frac{2}{5}$	$\frac{4}{9}$ $+\frac{1}{3}$	$7\frac{1}{6}$ $+1\frac{1}{3}$	$\frac{1}{4}$ $+\frac{5}{12}$
8.	$3\frac{5}{8}$ $+\frac{1}{4}$	$2\frac{1}{10}$ $+4\frac{1}{2}$	$1\frac{1}{2}$ $+\frac{5}{12}$	$\frac{4}{5}$ $+\frac{7}{20}$	$12\frac{7}{10}$ $+17\frac{1}{5}$	$\frac{5}{16}$ $+\frac{7}{8}$	$60\frac{2}{9}$ $+7\frac{2}{3}$

Copy and subtract. Check your remainders.

9.	$\frac{7}{10}$ $-\frac{1}{2}$	$\frac{3}{4}$ $-\frac{1}{12}$	$2\frac{3}{4}$ $-\frac{5}{8}$	$11\frac{1}{3}$ $-\frac{1}{6}$	$3\frac{9}{10}$ $-\frac{2}{5}$	$46\frac{2}{3}$ $-4\frac{4}{9}$	$\frac{5}{6}$ $-\frac{2}{3}$
10.	$\frac{2}{3}$ $-\frac{5}{12}$	$4\frac{7}{8}$ $-2\frac{1}{2}$	$3\frac{11}{12}$ $-1\frac{1}{3}$	$6\frac{7}{12}$ $-3\frac{1}{4}$	$\frac{7}{10}$ $-\frac{2}{5}$	$3\frac{7}{10}$ $-1\frac{1}{5}$	$4\frac{11}{12}$ $-2\frac{3}{4}$

➤ **Extra Practice.** Work Sets 47-49.

Problems Using Fractions

Differentiating A. and S. [W]

First think whether you should add (find the total) or subtract (find a remainder or a difference). Then work the problem.

1. Hilda was $48\frac{1}{8}$ in. tall when summer vacation began. During vacation she grew $\frac{3}{4}$ in. How tall was she then?

2. Mrs. Hunt bought $7\frac{1}{2}$ yd. of cotton dress material. She used $4\frac{1}{8}$ yd. for a dress. How many yards did she have left?

3. Paul jumped $9\frac{9}{10}$ ft. in a running jump and Fred jumped $9\frac{1}{2}$ ft. How much farther did Paul jump than Fred?

4. Sam put three boards together for a box cover. They were $3\frac{1}{8}$ in., 4 in., and $3\frac{3}{4}$ in. wide. How wide was the cover?

5. Clara tried to draw a line $5\frac{3}{4}$ in. long. It was only $5\frac{3}{8}$ in. long. How much too short was it?

More Adding and Subtracting of Unlike-Fractions

Carrying and borrowing [O]

1. For the candy sale, Jean made $\frac{3}{4}$ lb. of fudge on Monday, $2\frac{1}{2}$ lb. on Tuesday, and then $1\frac{1}{8}$ lb. on Wednesday. How much candy did she make in the three days?

Box A. Why is 8 and not 4 the common denominator?

Is the sum $3\frac{11}{8}$ in best form? Explain. In best form, $\frac{11}{8}$ is $1\frac{?}{8}$. We can carry this 1 and put it with the 3 that we already have in the sum. Then the sum in best form is $4\frac{?}{8}$.

A

$$\begin{array}{rcl} \frac{3}{4} & = & \frac{6}{8} \\ 2\frac{1}{2} & = & 2\frac{4}{8} \\ +1\frac{1}{8} & = & 1\frac{1}{8} \\ \hline & & 3\frac{11}{8} = 4\frac{3}{8} \end{array}$$

2. After feeding the chickens from $2\frac{1}{2}$ lb. of feed, Tom found that he had $\frac{3}{4}$ lb. left. How much feed had he used?

Box B. What is the common denominator? Can we subtract $\frac{3}{4}$ from $\frac{2}{4}$?

Before we can subtract, we must borrow 1 whole, or $\frac{?}{4}$. We put this $\frac{4}{4}$ with the $\frac{2}{4}$ that we already have in the minuend, to make $\frac{?}{4}$ in all. Now can we subtract?

B

$$\begin{array}{rcccl} 2\frac{1}{2} & = & 2\frac{2}{4} & = & 1\frac{6}{4} \\ -\frac{3}{4} & = & \frac{3}{4} & = & \frac{3}{4} \\ \hline & & & & 1\frac{3}{4} \end{array}$$

Explain the subtraction in box B.

[W]

Copy and add. Check by adding upward.

	a	b	c	d	e	f	g
3.	$2\frac{3}{5}$	$3\frac{2}{3}$	$1\frac{3}{4}$	$16\frac{4}{9}$	$1\frac{5}{8}$	$23\frac{2}{3}$	$11\frac{2}{5}$
	$+\frac{7}{10}$	$+\frac{5}{6}$	$+\frac{7}{8}$	$+2\frac{2}{3}$	$\frac{3}{4}$	$45\frac{5}{12}$	$48\frac{1}{10}$
					$+2\frac{3}{8}$	$+2\frac{1}{6}$	$+2\frac{3}{5}$

Copy and subtract. Check your remainders.

4.	$2\frac{1}{3}$	$2\frac{5}{12}$	$14\frac{1}{6}$	$22\frac{1}{4}$	$21\frac{1}{4}$	$43\frac{5}{12}$	$15\frac{1}{2}$
	$-1\frac{5}{6}$	$-\frac{3}{4}$	$-1\frac{1}{2}$	$-\frac{7}{12}$	$-9\frac{3}{8}$	$-1\frac{2}{3}$	$-2\frac{7}{10}$

Extra Practice. Work Sets 50 and 51.

Finding a Common Denominator

Common denominator not present [O]

So far, in adding or subtracting unlike-fractions you have used as common denominator a denominator that was given. For example, for $1\frac{3}{4} + \frac{5}{8}$, the denominator of $\frac{5}{8}$ is the common denominator. For $\frac{2}{3} - \frac{1}{6}$, what is the common denominator?

In Ex. 1–7 below, the fractions also are unlike, but none of the given denominators can be used as the common denominator of the fractions.

1. Betty mixed some pancakes. She used $\frac{3}{4}$ c. of milk and $\frac{1}{3}$ c. of water. How much liquid did she use?

A

$$\begin{aligned} \frac{3}{4} &= \frac{?}{?} \\ +\frac{1}{3} &= \frac{?}{?} \end{aligned}$$

To find a common denominator for adding, turn back to the fraction chart on page 114. Can $\frac{1}{3}$ be measured exactly by $\frac{1}{4}$? No; so 4 is not the common denominator.

From the chart, the smaller fractions you find which will exactly measure $\frac{1}{3}$ are $\frac{1}{6}$, $\frac{1}{?}$, $\frac{1}{?}$. The smaller fractions which will exactly measure $\frac{1}{4}$ are $\frac{1}{8}$, $\frac{1}{?}$, $\frac{1}{?}$.

Then what fraction measure is common to both $\frac{1}{3}$ and $\frac{1}{4}$? What are the common fractional unit and the common denominator for $\frac{3}{4}$ and $\frac{1}{3}$?

In box B, explain how to change $\frac{3}{4}$ and $\frac{1}{3}$ both to $\frac{1}{12}$'s.

Now explain how to finish the addition in box C.

B

$$\begin{aligned} \frac{3}{4} &= \frac{?}{12} \\ +\frac{1}{3} &= \frac{?}{12} \end{aligned}$$

C

$$\begin{aligned} \frac{3}{4} &= \frac{9}{12} \\ +\frac{1}{3} &= \frac{4}{12} \end{aligned}$$

Using the chart on page 114, tell the common fractional unit and the common denominator to be used in adding these:

2. $\frac{2}{3}$ and $\frac{1}{2}$
3. $\frac{5}{6}$ and $\frac{3}{4}$
4. $\frac{3}{5}$ and $\frac{1}{2}$
5. $\frac{1}{4}$ and $\frac{1}{3}$
6. $\frac{1}{2}$ and $\frac{2}{5}$
7. $\frac{1}{6}$ and $\frac{1}{4}$

[W]

Now add the fractions in Ex. 2–7.

A Short Cut

Finding smallest common denominator [O]

Finding a common denominator by making a chart is not always a quick way to work. You need to know a short cut.

1. In the addition of $\frac{3}{4} + \frac{1}{3}$ in box A, you know from your work with the chart that 12 is the common denominator. Could you find the same denominator by multiplying together the two given denominators? $3 \times 4 = ?$

A

$$\begin{aligned} \tfrac{3}{4} &= \tfrac{?}{12} \\ +\tfrac{1}{3} &= \tfrac{?}{12} \end{aligned}$$

By multiplying denominators, find a common denominator for

2. $\frac{2}{3}$ and $\frac{1}{2}$. 3. $\frac{1}{2}$ and $\frac{2}{5}$. 4. $\frac{2}{3}$ and $\frac{4}{5}$. 5. $\frac{2}{3}$ and $\frac{3}{4}$ and $\frac{7}{8}$.

You can always work with a common denominator found by multiplying together given denominators but, as in Ex. 5, sometimes this gives a very large denominator. It is better to find the *smallest* number that will exactly contain all given denominators.

6. What is the smallest number that will exactly contain 3, 4, and 8 (box B)?

B

$$\begin{aligned} \tfrac{2}{3} &= \tfrac{\ }{?} \\ \tfrac{3}{4} &= \tfrac{\ }{?} \\ \tfrac{7}{8} &= \tfrac{\ }{?} \end{aligned}$$

Will 8, the denominator of $\frac{7}{8}$, contain 4, the denominator of $\frac{3}{4}$? Will it contain 3, the denominator of $\frac{2}{3}$?

Try 2×8, or 16. Will 16 contain 4? Will it contain 3?
Try 3×8, or 24. Will 24 contain 4? Will it contain 3?
Because 24 is the smallest number that contains all the denominators, we call it the **smallest common denominator.**

Find the smallest common denominator for

7. $\frac{3}{4}$ and $\frac{5}{6}$. 8. $\frac{1}{6}$ and $\frac{3}{8}$. 9. $\frac{5}{12}$ and $\frac{7}{8}$. 10. $\frac{1}{2}, \frac{7}{8}, \frac{2}{3}$.

When no given denominator is a common denominator, we can find the smallest common denominator by multiplying the largest given denominator first by 2, then by 3, and so on, until we get a number that exactly contains all the given denominators.

[W]

Copy and work, using the smallest common denominator.

	a	b	c	d	e	f	g
11.	$\frac{1}{2}$ $+\frac{2}{3}$	$\frac{3}{4}$ $-\frac{2}{3}$	$3\frac{5}{6}$ $+1\frac{3}{4}$	$4\frac{3}{5}$ $-1\frac{1}{2}$	$2\frac{2}{3}$ $-\frac{4}{5}$	$8\frac{3}{8}$ $-4\frac{2}{3}$	$9\frac{1}{6}$ $+2\frac{7}{8}$
12.	$\frac{5}{8}$ $\frac{1}{6}$ $+\frac{1}{2}$	$2\frac{5}{12}$ $\frac{2}{3}$ $+\frac{3}{8}$	$3\frac{1}{3}$ $7\frac{3}{4}$ $+1\frac{5}{6}$	$4\frac{2}{3}$ $3\frac{1}{4}$ $+2\frac{7}{8}$	$2\frac{3}{4}$ $3\frac{1}{2}$ $+1\frac{3}{5}$	$3\frac{5}{6}$ $\frac{4}{9}$ $+1\frac{1}{2}$	$7\frac{1}{3}$ $3\frac{5}{8}$ $+2\frac{2}{3}$

Extra Practice. Work Sets 52 and 53.

What Is Wrong?

Problems; A., S. of unlike-fractions [O]

Tell why these children's solutions are wrong.

1. Marge: Yesterday I spent $\frac{1}{2}$ hr. on my music lesson in the morning and $\frac{1}{4}$ hr. in the afternoon. How long did I spend in all yesterday?

2. Tom: I rode my bicycle $\frac{3}{4}$ mi. from my house to Ed's house, and then $\frac{1}{4}$ mi. farther, on the same road, to the pond. How far is it from my house to the pond?

3. Bill: Our house lot contains $\frac{5}{8}$ acre. When my father bought $\frac{7}{8}$ acre next to ours, how much land did he own?

4. Jean: I bought three candy bars weighing $\frac{7}{8}$ oz., $\frac{3}{8}$ oz., and $\frac{1}{4}$ oz. How many ounces of candy was that?

5. Alec: Dad said that he'd give me either $\frac{3}{6}$ of the money in his pocket or $\frac{2}{3}$ of it, whichever I thought was the larger amount. I chose $\frac{3}{6}$.

Why wrong?

Marge

$\frac{1}{2} + \frac{1}{4} = \frac{1}{6}$

Tom

$\frac{3}{4} - \frac{1}{4} = \frac{2}{4}$, or $\frac{1}{2}$

Bill

$\frac{5}{8} + \frac{7}{8} = \frac{12}{16}$, or $\frac{3}{4}$

Jean

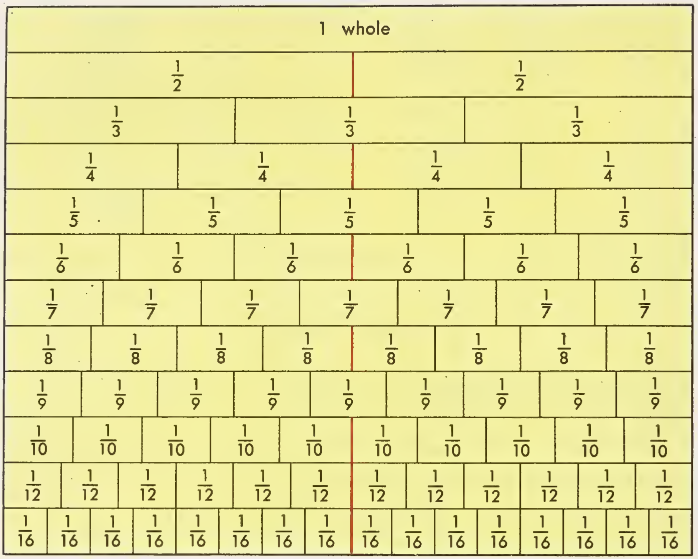
$$\begin{array}{r} \frac{7}{8} \\ \frac{3}{8} \\ +\frac{1}{4} \\ \hline \frac{14}{8} \end{array} = 1\frac{6}{8}\text{, or } 1\frac{3}{4}$$

Alec

$\frac{3}{6} - \frac{2}{3} = \frac{1}{3}$

Rounding and Estimating

Meaning; fractions and mixed numbers [O]



1. On the chart above, is $\frac{3}{4}$ more or less than $\frac{1}{2}$? Why do we round $\frac{3}{4}$ to 1 instead of to 0? Would $2\frac{3}{4}$ be rounded to 2 or to 3?

2. To round $6\frac{3}{8}$, first look at $\frac{3}{8}$ on the chart. Is $\frac{3}{8}$ more or less than $\frac{1}{2}$? Would $6\frac{3}{8}$ be rounded to 6 or to 7?

3. Is $\frac{11}{12}$ more or less than $\frac{1}{2}$? Round $5\frac{11}{12}$ to a whole number.

4. Is $\frac{7}{16}$ more or less than $\frac{1}{2}$? Round $15\frac{7}{16}$ to a whole number.

In rounding a mixed number, when the fraction is equal to $\frac{1}{2}$ or greater than $\frac{1}{2}$, add 1 to the whole number and drop the fraction. When the fraction is less than $\frac{1}{2}$, drop it.

By rounding, estimate answers for these: (When the fraction is exactly $\frac{1}{2}$, round to the next larger whole number.)

5. $3\frac{1}{2} + 8\frac{11}{12}$

6. $7\frac{2}{5} - 4\frac{9}{10}$

7. $3\frac{2}{3} + 2\frac{3}{4} + 4\frac{1}{2}$

Fractions in the Kitchen

A. and S. of unlike-fractions [W]

Write all your work for Ex. 1–4.

1. Bill's father, Mr. Oaks, cooked the dinner when his club met at his house. He made his favorite beef stew. To the cooked beef, he added $1\frac{1}{4}$ cups of sliced onions, $7\frac{1}{2}$ cups of diced potatoes, $1\frac{1}{4}$ cups of diced carrots, and $1\frac{2}{3}$ cups of diced turnips. How many cups of vegetables did he use in all?

2. His recipe for fudge pie takes 9 oz. of grated chocolate. He used up an opened package of grated chocolate containing $7\frac{1}{2}$ oz. How much more chocolate did he have to take from another package?

3. When Mr. Oaks started to make mayonnaise he found that there was only $1\frac{1}{8}$ cups of olive oil in the house. The recipe required $2\frac{1}{2}$ cups of oil, so he used peanut oil for the remainder. How much peanut oil did he need to use?

4. Earlier in the day, Mrs. Oaks had made raisin squares from a recipe which calls for $1\frac{1}{2}$ cups of raisins and $2\frac{1}{4}$ cups of shredded coconut. She measured $1\frac{1}{2}$ cups of raisins in a 4-cup measure, and added coconut in the same cup. To what mark on the cup did the coconut come?

5. Bring from home a recipe with unlike-fractions.

Helps for Solving Problems

[O]

You have been working with whole numbers and fractions, both in practice and in problems. Do you always know how to solve the problems? Here are some ways to help yourself.

What is asked?

One way to help yourself is to tell in your own words what you are to find. Tell what you must find in problems 1–3.

1. Bob collects bird pictures. He has pictures of 4 warblers, 3 owls, 3 hawks, and 2 tanagers. How many pictures has he?

2. A jar filled with hard candies weighs 1 lb. It contains $10\frac{1}{2}$ oz. of candy. How much does the empty jar weigh?

3. Bill found on the beach a wide plank 8 ft. long. His father said that this size of plank is worth 24¢ for each foot of the length. How much was Bill's plank worth?

Do you put groups together or separate groups?

Another help is to ask yourself whether the problem tells about groups that are to be combined or about groups that are to be compared or separated. Do this for problems 4–6.

4. When Sally started piano lessons, her mother paid the teacher $2.50 a week. How much was the cost of lessons for 5 weeks?

5. A year ago Linda weighed $98\frac{3}{4}$ lb. Now she weighs $104\frac{1}{2}$ lb. How many pounds has she gained?

6. Mrs. Hamilton bought a lamp base for $2.25 and a lampshade for 69¢. How much did she pay for the complete lamp?

Even if you know whether to put groups together or to separate or compare groups, you must decide what process to use.

Putting groups together

We add to find the total when we put together unequal groups.
We multiply to find the total when we put together equal groups.

Separating groups

We subtract to find the other part of a group or the difference between two groups.
We divide to find how many equal small groups in a larger group or how many in each of a number of equal groups.

For problems 7–10, tell whether you should add, subtract, multiply, or divide.

7. Ken's pad of paper has 48 sheets. If he uses 3 sheets a day, how long will the pad last?

8. The hall clock in Ted's house was made in the year 1750. About how old is the clock now?

9. At $2.10 a foot, how much will a 24-foot aluminum extension ladder cost?

10. A cake recipe directs that $\frac{1}{2}$ cup of milk be added first, and $\frac{3}{4}$ cup of milk later. How much milk is used in all?

What is the estimated answer?

It is a good plan to use round numbers and estimate the answer before you work a problem. This helps you to decide whether your answer is reasonable. Estimate answers for problems 11–12.

11. Joe is 12 yr. old, and his father is 41. How old was Joe's father when Joe was born?

12. Ed watched television $1\frac{1}{4}$ hr. on Friday and $2\frac{11}{12}$ hr. on Saturday. How many hours was that in all?

[W]

Now go back and solve problems 1–12.

Too Many Numbers or Too Few?

Help in problem-solving [O]

Sometimes there are more numbers in a problem than you need, and sometimes not enough. For each of problems 1–9, tell whether there are too many numbers or too few.

1. Sue paid $1.47 for 3 yd. of percale. How much change should she get from a $5.00 bill?

2. For Christmas presents, Sally pasted colored paper on matchbook covers. If she packs 25 matchbooks in a Christmas box, how many boxes can she fill from 2 store packages of matchbooks?

3. Ted has 8 pieces of straight track for his model railway. How many more pieces does he need in order to lay 9 ft. of straight track?

4. If a bushel of potatoes weighs 60 lb., what does a peck of potatoes weigh?

5. At the diner where Joe's father eats lunch, coffee with cream costs 10¢ but black coffee costs only 7¢. How much would Joe's father have to pay for 2 cups of black coffee?

6. Mrs. Alger bought 4 lamb chops priced at 79¢ a pound. How much did they cost?

7. Ted bought a box of candy and gave the clerk 50¢. How much change did he get?

8. Mary had 4 yd. of cotton material. She used $\frac{1}{2}$ yd. for one apron and $\frac{7}{8}$ yd. for another apron. Was there enough material left for a dress?

9. Mr. Farwell said that the piece of molding was just $\frac{3}{4}$ inch too short. How long a piece of molding did he need?

[W]

Now go back and solve problems 1–9. When you come to a problem that has too few numbers, first supply the necessary information. Then work the problem.

Do You Understand?

Test of Information and Meaning 3

On your paper write the words or numbers that will complete Ex. 1–5 correctly.

1. The numerator and the denominator of a fraction are called its _?_.

2. In best form, $5\frac{12}{8}$ = _?_. **3.** $1 = \frac{?}{7}$.

4. To subtract $4\frac{3}{4}$ from 30, we must change 30 to _?_.

5. To subtract $5\frac{9}{10}$ from $8\frac{3}{10}$, we must change $8\frac{3}{10}$ to _?_.

6. Write an improper fraction; a mixed number; a proper fraction.

7. Does $11\frac{3}{4}$ mean $11 + \frac{3}{4}$ or $11 \times \frac{3}{4}$?

8. Which of the following improper fractions is equal to $9\frac{5}{7}$?

$\frac{14}{7}$, $\frac{68}{7}$, $\frac{45}{7}$

9. Which is larger:

a. $\frac{1}{2}$ or $\frac{2}{3}$? **b.** $\frac{2}{3}$ or $\frac{3}{4}$? **c.** $\frac{5}{6}$ or $\frac{7}{8}$? **d.** $\frac{3}{10}$ or $\frac{3}{16}$?

10. In which of the following sets are the fractions like-fractions?

a. $\frac{1}{6}$, $\frac{2}{3}$, $\frac{5}{12}$ **b.** $\frac{5}{16}$, $\frac{5}{8}$, $\frac{5}{6}$ **c.** $\frac{3}{10}$, $\frac{7}{10}$, $\frac{1}{10}$

11. Use the Golden Rule of Fractions to change

a. $\frac{2}{3}$ to ninths; **b.** $\frac{5}{8}$ to twenty-fourths; **c.** $\frac{15}{18}$ to lowest terms.

12. Write the smallest common denominator for each of the following examples:

a. $\frac{2}{5} + \frac{1}{3}$ **b.** $\frac{5}{6} - \frac{3}{8}$ **c.** $\frac{1}{6} + \frac{5}{9}$ **d.** $\frac{13}{16} - \frac{3}{4}$

13. Round each of these to the nearest whole number:

a. $4\frac{2}{3}$ **b.** $18\frac{1}{4}$ **c.** $16\frac{5}{12}$ **d.** $12\frac{3}{8}$

14. Write estimated answers for the following examples:

a. $4\frac{1}{3} + 8\frac{5}{6} + 2\frac{7}{8} + 1\frac{3}{10}$ **c.** $13\frac{3}{5} - 7\frac{1}{2}$

b. $89\frac{15}{16} - 21\frac{1}{8}$ **d.** $6\frac{1}{2} + 2\frac{2}{5} + 4\frac{3}{10} + 7\frac{2}{3}$

Do You Make Mistakes?

Diagnostic Test 3

		Study Pages	Practice Sets
1.	Write the fractional unit for each. $\frac{7}{8}$ $\frac{5}{6}$ $\frac{11}{12}$ $\frac{9}{16}$ $\frac{3}{4}$	99	
2.	Which is larger? $\frac{1}{6}$ or $\frac{1}{5}$ $\frac{1}{8}$ or $\frac{1}{10}$ $\frac{1}{4}$ or $\frac{1}{2}$ $\frac{1}{3}$ or $\frac{1}{4}$	102	
3.	Change to equal fractions. $\frac{3}{4} = \frac{?}{8}$ $\frac{4}{6} = \frac{?}{3}$ $\frac{9}{12} = \frac{?}{4}$ $\frac{12}{16} = \frac{?}{4}$	106-107	32, 41
4.	Change to best form. $\frac{17}{8}$ $\frac{21}{6}$ $\frac{8}{8}$ $\frac{10}{4}$ $\frac{11}{3}$	108-109	42
5.	Add or subtract. a b c d $\frac{1}{5} + \frac{4}{5}$ $\frac{7}{8} - \frac{1}{8}$ $\frac{1}{6} + \frac{5}{6}$ $\frac{9}{10} - \frac{3}{10}$	110-111	43, 44
6.	Change to fractions with smallest common denominator. $\frac{2}{3}$ and $\frac{5}{6}$ $\frac{3}{4}$ and $\frac{1}{2}$ $\frac{2}{3}$ and $\frac{1}{4}$ $\frac{1}{6}$ and $\frac{5}{9}$	114-115, 119, 120	47
7.	Add or subtract. $6\frac{1}{4} + 2\frac{1}{2}$ $7\frac{5}{6} + 2\frac{2}{3}$ $4\frac{5}{8} - 1\frac{1}{4}$ $5\frac{1}{9} - 3\frac{2}{3}$	116-117, 118	45, 46 48-51
8.	Add or subtract. $4\frac{1}{5} - 2\frac{2}{3}$ $5\frac{2}{3} + 7\frac{1}{8}$ $9\frac{3}{4} - 7\frac{1}{3}$ $3\frac{1}{2} + 8\frac{2}{3}$	119-120	52, 53

Can You Solve Problems?

Problem Test 3

First write your estimate of the answer before solving each problem.

1. At the cheese counter, Mother bought $8\frac{1}{2}$ oz. of Danish cheese and $2\frac{2}{3}$ oz. of Swiss cheese in packages. How much more did the Danish cheese weigh than the Swiss cheese?

2. Jim said that he needed $4\frac{1}{2}$ yd. of cord to rig his toy sailboat. His mother gave him $6\frac{1}{3}$ yd. How much more did she give him than he said he needed?

3. Mother bought spices in boxes—cinnamon, $1\frac{1}{2}$ oz.; cloves, $1\frac{1}{8}$ oz.; nutmeg, $1\frac{1}{4}$ oz. What was the total weight?

4. On her way to Grandma's, Lucy rode her bicycle $2\frac{7}{8}$ mi. and pushed it $\frac{1}{4}$ mi. How far was it to Grandma's?

5. After filling the empty sugar can from a 5-pound bag of sugar, Mrs. Lee had $2\frac{3}{8}$ lb. left. How much did the can hold?

6. One house lot is $85\frac{3}{4}$ ft. wide and one next to it is $98\frac{7}{8}$ ft. What is the total width of the two house lots?

7. Linda wrote $\frac{7}{16}$ of the package of cards and Dale wrote $\frac{1}{2}$ of the package. Which wrote more? How much more?

8. Mrs. Douglas had $5\frac{1}{2}$ yd. of curtain material and bought $3\frac{3}{4}$ yd. more of the same kind. How much curtain material did she have then?

How Well Can You Figure?

Computation Test 3

1. Change these numbers to best form:

$8\frac{6}{8}$ $\quad\frac{12}{16}$ $\quad\frac{35}{7}$ $\quad5\frac{12}{8}$ $\quad\frac{39}{4}$ $\quad1\frac{13}{10}$ $\quad6\frac{14}{16}$ $\quad2\frac{9}{6}$

2. Subtract each of the following fractions from 1:

$\frac{2}{3}$ $\quad\frac{7}{10}$ $\quad\frac{5}{9}$ $\quad\frac{5}{8}$ $\quad\frac{3}{7}$ $\quad\frac{8}{11}$ $\quad\frac{5}{6}$ $\quad\frac{3}{4}$

Copy and work the following:

3. $\begin{array}{r} 4\frac{2}{3} \\ +1\frac{5}{6} \\ \hline \end{array}$ **4.** $\begin{array}{r} 9\frac{3}{4} \\ -2\frac{1}{8} \\ \hline \end{array}$ **5.** $\begin{array}{r} 8\frac{1}{2} \\ +4\frac{7}{8} \\ \hline \end{array}$ **6.** $\begin{array}{r} 24\frac{5}{6} \\ -9\frac{1}{2} \\ \hline \end{array}$

7. $\begin{array}{r} 8\frac{1}{2} \\ +2\frac{3}{4} \\ \hline \end{array}$ **8.** $\begin{array}{r} 7\frac{1}{8} \\ -2\frac{1}{2} \\ \hline \end{array}$ **9.** $\begin{array}{r} 24\frac{1}{12} \\ -8\frac{5}{6} \\ \hline \end{array}$ **10.** $\begin{array}{r} 36\frac{1}{3} \\ +7\frac{5}{9} \\ \hline \end{array}$

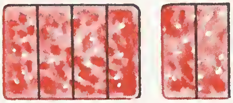
11. $\begin{array}{r} 4\frac{1}{3} \\ +8\frac{1}{4} \\ \hline \end{array}$ **12.** $\begin{array}{r} 16\frac{4}{5} \\ +8\frac{7}{10} \\ \hline \end{array}$ **13.** $\begin{array}{r} 18\frac{1}{2} \\ -5\frac{1}{3} \\ \hline \end{array}$ **14.** $\begin{array}{r} 16\frac{1}{5} \\ -8\frac{2}{3} \\ \hline \end{array}$

4

An All-Day Hike

M. of a fraction by a whole number; meaning [O]

1. Six boys who were going on an all-day hike put up their own lunches. For each boy they allowed $\frac{1}{4}$ can of meat. How many cans of meat did they use in all?



To find this answer, you can use the drawing at the right. Count the $\frac{1}{4}$'s that you see. Which is the best way to write the number of cans used: $\frac{6}{4}$ or $1\frac{2}{4}$ or $1\frac{1}{2}$? Explain.

You can also add to find the answer:

$$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{6}{4}, \text{ or } 1\frac{?}{4}, \text{ or } 1\frac{?}{2}.$$

These addends are equal, so you can multiply instead of adding. For 6 boys, how many $\frac{1}{4}$'s were used? Six $\frac{1}{4}$'s = $\frac{?}{4}$. From box A, tell how to give the answer in best form.

A

Six $\frac{1}{4}$'s = $\frac{?}{4}$

$\frac{?}{4} = 1\frac{?}{4}$, or $1\frac{?}{2}$

2. They allowed $\frac{1}{3}$ of a package of ginger snaps for each of the 6 hikers. How many packages did they need?

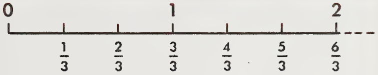
Box B shows how to find the answer with a number line. On line B, six $\frac{1}{3}$'s = $\frac{?}{3}$, or _?_.

Explain box C.

The work in box D is like multiplying any whole number. Explain.

Box E shows how to multiply the fraction. $6 \times \frac{1}{3}$ is six $\frac{1}{3}$'s, or _?_.

B



C

$\frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{?}{3}$, or _?_

D

6 × 1 third = 6 thirds, or $\frac{6}{3}$, or _?_

E

$6 \times \frac{1}{3} = \frac{?}{3} = 2$

3. As in box D, say these multiplications: **a.** $4 \times \frac{1}{4}$; **b.** $5 \times \frac{1}{3}$; **c.** $6 \times \frac{1}{2}$; **d.** $10 \times \frac{1}{5}$; **e.** $9 \times \frac{1}{6}$; **f.** $12 \times \frac{1}{8}$.

[W]

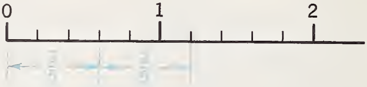
4. Now, as in box E, write the multiplications in Ex. 3.

How Many in All?

Whole number × fraction [O]

1. Ted's school is $\frac{3}{5}$ mile from his home. How far does he walk in going to school and home again?

You can add to find the answer. $2 \times \frac{3}{5} = \frac{3}{5} + \frac{3}{5}$, or $\frac{?}{5}$. In best form, $\frac{6}{5} = 1\frac{?}{5}$.



You can use a number line. $2 \times \frac{3}{5} = \frac{?}{5}$, or $1\frac{?}{5}$.

Remember that the 3 in $\frac{3}{5}$ means that there are three $\frac{1}{5}$'s. Then for $2 \times \frac{3}{5}$ there would be twice as many $\frac{1}{5}$'s, or _?_ $\frac{1}{5}$'s. Explain.

Box A shows you how to find $2 \times \frac{3}{5}$ with figures. What is the multiplier? the multiplicand? the product?

A

$$2 \times \frac{3}{5} = \frac{2 \times 3}{5}, \text{ or } \frac{6}{5}, \text{ or } 1\frac{1}{5}$$

2. Explain the multiplication in box B. In best form, $\frac{45}{4} = ?$

B

$$15 \times \frac{3}{4} = \frac{15 \times 3}{4}, \text{ or } \frac{45}{4}, \text{ or \_?\_}$$

To multiply a fraction by a whole number, multiply the numerator of the fraction by the whole number to get the total number of equal parts. Then show the size of the parts by writing the same denominator as in the given fraction.

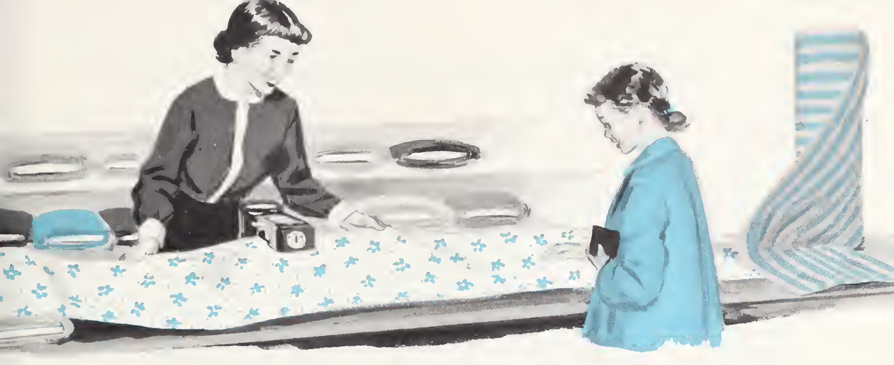
[W]

Multiply as in box B. Give your answers in best form.

	a	b	c	d	e	f
3.	$6 \times \frac{1}{2}$	$6 \times \frac{2}{3}$	$3 \times \frac{1}{8}$	$5 \times \frac{3}{4}$	$4 \times \frac{2}{5}$	$7 \times \frac{1}{3}$
4.	$4 \times \frac{2}{3}$	$8 \times \frac{2}{3}$	$4 \times \frac{3}{8}$	$3 \times \frac{2}{3}$	$6 \times \frac{7}{8}$	$3 \times \frac{2}{5}$
5.	$6 \times \frac{3}{4}$	$7 \times \frac{3}{8}$	$10 \times \frac{3}{4}$	$8 \times \frac{4}{5}$	$9 \times \frac{2}{3}$	$3 \times \frac{7}{8}$
6.	$12 \times \frac{5}{6}$	$14 \times \frac{2}{3}$	$9 \times \frac{3}{5}$	$5 \times \frac{3}{8}$	$7 \times \frac{2}{3}$	$7 \times \frac{5}{8}$

Check your answers for row 3 by adding.

Extra Practice. Work Set 54.



Fraction Problems

Differentiating A. and M.; using a number line [O]

When Alex worked problems 1 to 5 on this page, he first wrote the examples which follow the problems. For which problem did Alex write the wrong example?

1. If it takes $\frac{3}{4}$ yd. of nylon to make a scarf, how much nylon will be needed for 3 such scarves? $3 \times \frac{3}{4} = ?$

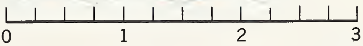
2. Mr. Lusk raises Angora rabbits. He has just sheared 3 of them. One yielded $\frac{3}{8}$ lb. of hair, another $\frac{1}{2}$ lb., and the third $\frac{1}{4}$ lb. How many pounds of hair did Mr. Lusk get from the three rabbits together? $\frac{3}{8} + \frac{1}{2} + \frac{1}{4} = ?$

3. Each day Mr. Lusk feeds his rabbits $\frac{1}{4}$ pk. of oats. How many pecks does he feed them in 7 days? $7 \times \frac{1}{4} = ?$

4. If $\frac{2}{3}$ cup of sugar is needed for one apple pie, how many cups are needed for 4 apple pies? $4 + \frac{2}{3} = ?$

5. Tom's notebook weighs $\frac{3}{8}$ pound. How much would five such notebooks weigh? $5 \times \frac{3}{8} = ?$

Explain how to work problem 1 on this number line.

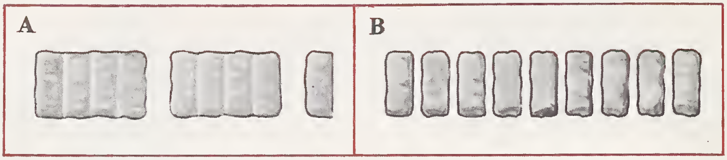


[W]

Now find the answer for each problem by using a number line. Then write each example with its answer in best form.

Making a Fraction from a Mixed Number

Changing to improper fraction [O]



1. In box A there are $2\frac{1}{4}$ candy bars. In box B the $2\frac{1}{4}$ bars have been cut up into $\frac{1}{4}$'s. How many $\frac{1}{4}$'s are there?

2. From boxes A and B, you know that the mixed number $2\frac{1}{4}$ is equal to the improper fraction $\frac{?}{4}$.

3. On the board draw candy bars to find out what improper fraction is equal to $3\frac{1}{3}$; to $4\frac{1}{2}$.

In changing 1 whole to $\frac{1}{4}$'s, you know that there are four $\frac{1}{4}$'s. In changing to $\frac{1}{3}$'s, you know that there are three $\frac{1}{3}$'s, and so on.

4. You can change 6 to $\frac{1}{4}$'s without making a drawing.

In 1 whole there are four $\frac{1}{4}$'s, so in 6 wholes there are 6 times as many $\frac{1}{4}$'s, or 24 of them. $6 = \frac{?}{4}$

In this same way tell how many

5. $\frac{1}{3}$'s in 5. 6. $\frac{1}{2}$'s in 7. 7. $\frac{1}{5}$'s in 8.

You can change a mixed number to an improper fraction in much the same way. The denominator of the fraction shows you what the fractional unit of the improper fraction is to be.

8. Change $3\frac{1}{4}$ to an improper fraction.

HELPER. $3 = \frac{12}{4}$. $\frac{12}{4}$ plus the other $\frac{1}{4}$ equals $\frac{?}{4}$.

Change these mixed numbers to improper fractions without making a drawing:

9. $5\frac{1}{2}$ 10. $8\frac{1}{3}$ 11. $4\frac{2}{3}$ 12. $6\frac{3}{5}$ 13. $3\frac{1}{8}$ 14. $7\frac{3}{4}$

➤ **Extra Practice.** Work Set 55.

Multiplying a Mixed Number

Whole number × mixed number [O]

1. Mrs. Fox bought 6 wedges of cheese each marked $1\frac{1}{3}$ oz. How many ounces of cheese did she buy? $6 \times 1\frac{1}{3} = ?$

The box shows one way to find $6 \times 1\frac{1}{3}$. The mixed number $1\frac{1}{3}$ is changed to $\frac{?}{3}$ before it is multiplied. Explain each step in finding the product, 8.

$$6 \times 1\frac{1}{3} = 6 \times \frac{4}{3}$$

$$6 \times \frac{4}{3} = \frac{6 \times 4}{3}, \text{ or } \frac{24}{3}, \text{ or } 8$$

Mrs. Fox bought 8 ounces of cheese.

To multiply a mixed number by a whole number, change the mixed number to an improper fraction. Then multiply this fraction by the whole number.

[W]

Change these mixed numbers to improper fractions:

	a	b	c	d	e	f
2.	$1\frac{5}{6}$	$8\frac{1}{2}$	$1\frac{3}{4}$	$7\frac{1}{3}$	$3\frac{5}{8}$	$1\frac{2}{3}$
3.	$3\frac{1}{3}$	$2\frac{1}{2}$	$5\frac{1}{4}$	$3\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{1}{6}$
4.	$2\frac{1}{4}$	$3\frac{1}{7}$	$2\frac{3}{10}$	$2\frac{5}{12}$	$3\frac{3}{8}$	$4\frac{1}{5}$

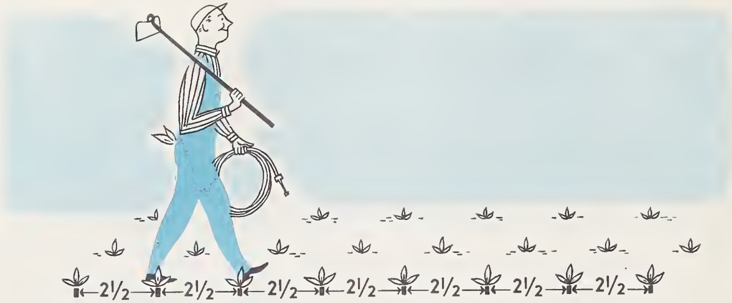
As in the box above, multiply in rows 5–7.

	a	b	c	d	e
5.	$8 \times 6\frac{3}{4}$	$6 \times 2\frac{7}{8}$	$9 \times 1\frac{3}{4}$	$5 \times 4\frac{2}{3}$	$4 \times 2\frac{5}{6}$
6.	$7 \times 3\frac{2}{5}$	$5 \times 2\frac{4}{15}$	$6 \times 2\frac{5}{9}$	$4 \times 3\frac{7}{12}$	$8 \times 1\frac{3}{16}$
7.	$2 \times 2\frac{4}{5}$	$7 \times 2\frac{4}{7}$	$8 \times 5\frac{1}{6}$	$3 \times 2\frac{1}{8}$	$6 \times 4\frac{2}{9}$

Find products for the examples in rows 8–10. Check your answers for row 8 by adding.

8.	$5 \times \frac{1}{8}$	$4 \times \frac{5}{6}$	$8 \times 2\frac{4}{9}$	$5 \times 1\frac{9}{10}$	$12 \times \frac{3}{4}$
9.	$18 \times \frac{1}{6}$	$3 \times 2\frac{11}{12}$	$4 \times \frac{5}{9}$	$2 \times 3\frac{5}{16}$	$6 \times 7\frac{2}{3}$
10.	$2 \times \frac{5}{32}$	$4 \times 1\frac{7}{20}$	$5 \times \frac{2}{15}$	$3 \times \frac{7}{24}$	$6 \times 1\frac{1}{12}$

➤ **Extra Practice.** Work Set 56.



Multiplying a Mixed Number Another Way

A whole number × a mixed number [O]

1. The length of Mr. Kent's steps is $2\frac{1}{2}$ ft. From the picture, find the length of a row in his garden. _?_ × $2\frac{1}{2}$ = ?

You can change $2\frac{1}{2}$ to an improper fraction as on page 134. Another way is to separate the mixed number into parts and multiply the parts, as in box A.

$2\frac{1}{2} = 2 + \frac{1}{2}$. In box A, explain how we multiply parts.

Name the partial products.

2. Box B. Tell the parts of $2\frac{5}{6}$. Explain the side work Ralph did to get the partial product $6\frac{2}{3}$. Explain the rest of the work.

A

$$\begin{array}{r} 2\frac{1}{2} \\ \times 7 \\ \hline 3\frac{1}{2} \\ 14 \\ \hline 17\frac{1}{2} \end{array}$$

Side work

$7 \times \frac{1}{2} = \frac{7}{2}$, or $3\frac{1}{2}$

B

$$\begin{array}{r} 2\frac{5}{6} \\ \times 8 \\ \hline 6\frac{2}{3} \\ 16 \\ \hline 22\frac{2}{3} \end{array}$$

Side work

$8 \times \frac{5}{6} = \frac{?}{6}$, or _?_

To multiply a mixed number by a whole number, you can multiply the parts separately, first the fraction and then the whole number, and then add the partial products.

[W]

Copy and multiply as in the boxes above.

	a	b	c	d	e	f
3.	$4 \times 1\frac{1}{2}$	$5 \times 3\frac{3}{4}$	$6 \times 4\frac{2}{3}$	$4 \times 1\frac{3}{4}$	$3 \times 2\frac{1}{3}$	$4 \times 3\frac{2}{5}$
4.	$3 \times 4\frac{1}{6}$	$7 \times 5\frac{2}{3}$	$4 \times 2\frac{1}{8}$	$2 \times 1\frac{3}{8}$	$8 \times 2\frac{1}{2}$	$4 \times 8\frac{2}{3}$

Check each answer for row 3 by multiplying as on page 135.

Using Fractions in Problems

M. of fractions and mixed numbers by whole numbers [W]

Write your work to find the answers. You can multiply as on page 135 or as on page 136, whichever way is easier for you.

1. The advertisement for a mountain climber's pack sack gave the weight as $12\frac{1}{2}$ lb. What will 2 of these packs weigh?

2. Tony planted 5 rows of bush beans $1\frac{1}{2}$ feet apart. How many feet was it from the first row to the fifth?

HELPER. Draw a diagram to see whether you multiply $1\frac{1}{2}$ by 4 or by 5.

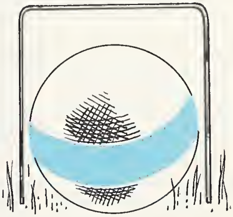
3. Sally's recipe for cookies calls for $2\frac{1}{4}$ cups of flour. If she doubles the recipe, how much flour should she use?

4. If she allows $1\frac{3}{8}$ yards for each apron, how much material will Mrs. Hooper need for 3 aprons?

5. To get ready for a weight-lifting contest, Mr. Henry added $\frac{3}{4}$ lb. each day to the bar he lifted for practice. If the bar weighed 75 lb. at first, how much did it weigh after he added this much weight on each of 28 days?

6. Elinor's sister works in a candy store. If she packs $1\frac{1}{2}$ lb. of candy in each box, how much candy will she use in filling 12 boxes?

7. According to the official rules for croquet, the width of the wickets should be $3\frac{3}{8}$ inches,—which leaves a $\frac{1}{8}$-inch margin on each side of the ball as it passes through the wicket. How much room does the croquet ball take?



8. Kenny's father wants to make two rope swings for the backyard playground. Each swing will take $18\frac{1}{2}$ feet of rope. How much will the rope cost at $8\frac{1}{2}$¢ a foot? (Count any fraction of a cent in the answer as another cent.)

Can We Multiply by a Fraction?

Meaning: fraction × whole number [O]

1. In box A, the red multiplier is one half as large as the black multiplier. The red product is also _?_ as large as the black product.

2. Finish: In box B, the red multiplier is one half as large as the black multiplier; so the red _?_ is also one half as large as the black _?_.

3. If making a multiplier one half as large also makes the product one half as large, what product would you get for the red question mark in box C?

A
$4 \times 4 = 16$
$2 \times 4 = 8$

B
$2 \times 4 = 8$
$1 \times 4 = 4$

C
$1 \times 4 = 4$
$\frac{1}{2} \times 4 = ?$

4. You are probably surprised to find that a multiplier can be a fraction. Find the product of $\frac{1}{3} \times 6$ by explaining the work in boxes D and E.

For box E you found that $\frac{1}{3} \times 6 = 2$. Would you get the same answer for $\frac{1}{3}$ of 6? Instead of saying "$\frac{1}{3}$ times 6," we usually think and say, "$\frac{1}{3}$ of 6."

D
$3 \times 6 = 18$
$1 \times 6 = ?$

E
$1 \times 6 = 6$
$\frac{1}{3} \times 6 = ?$

Read the following, saying "of" each time you see ×.

	a	b	c	d	e
5.	$\frac{1}{8} \times 16$	$\frac{1}{5} \times 20$	$\frac{1}{2} \times 24$	$\frac{1}{7} \times 28$	$\frac{1}{6} \times 42$
6.	$\frac{1}{4} \times 8$	$\frac{1}{3} \times 12$	$\frac{1}{9} \times 27$	$\frac{1}{6} \times 18$	$\frac{1}{8} \times 32$
7.	$\frac{1}{2} \times 12$	$\frac{1}{8} \times 24$	$\frac{1}{4} \times 28$	$\frac{1}{5} \times 15$	$\frac{1}{7} \times 21$
8.	$\frac{1}{3} \times 18$	$\frac{1}{6} \times 30$	$\frac{1}{9} \times 36$	$\frac{1}{4} \times 20$	$\frac{1}{8} \times 40$
9.	$\frac{1}{5} \times 25$	$\frac{1}{4} \times 16$	$\frac{1}{6} \times 48$	$\frac{1}{3} \times 15$	$\frac{1}{9} \times 45$

Thinking "of" for ×, say the products for rows 5–9. For Ex. 5a, say, "$\frac{1}{8}$ times 16 = $\frac{1}{8}$ of 16, or 2."

10. $\frac{2}{3} \times 12 = ?$ *Think*, "$\frac{2}{3}$ of $12 = ?$"

Without any trouble, you can tell the product for $\frac{1}{3}$ of 12.

$\frac{2}{3}$ is 2 times as much as $\frac{1}{3}$, so $\frac{2}{3}$ of 12 is 2 times as much as $\frac{1}{3}$ of 12. Explain the work in box F.

Box G shows a quicker way to find $\frac{2}{3} \times 12$. In box F, we found $\frac{1}{3}$ of 12 and then made that answer twice as large. In box G, we double the multiplicand and then take $\frac{1}{3}$ of this product. See if you can explain why both boxes show the same final product.

F

$\frac{2}{3} \times 12 = ?$

$\frac{1}{3}$ of $12 = 4$, so

$\frac{2}{3}$ of $12 = 2 \times 4$, or 8

G

$$\frac{2}{3} \times 12 = ?$$

$$\frac{2 \times 12}{3} = \frac{24}{3}, \text{ or } 8$$

11–14. Explain the work in boxes H–K.

H

$$\frac{3}{4} \times 8 = \frac{3 \times 8}{4}, \text{ or } \frac{24}{4}, \text{ or } 6$$

I

$$\frac{2}{5} \times 10 = \frac{2 \times 10}{5}, \text{ or } \frac{20}{5}, \text{ or } 4$$

J

$$\frac{3}{8} \times 10 = \frac{3 \times 10}{8}, \text{ or } \frac{30}{8}, \text{ or } 3\tfrac{6}{8}, \text{ or } 3\tfrac{3}{4}$$

K

$$\frac{5}{6} \times 8 = \frac{5 \times 8}{6}, \text{ or } \frac{40}{6}, \text{ or } 6\tfrac{4}{6}, \text{ or } 6\tfrac{2}{3}$$

[W]

As in boxes H–K, find **n**, the missing product.

	a	b	c	d
15.	$\frac{3}{4} \times 12 = n$	$\frac{5}{6} \times 54 = n$	$\frac{6}{7} \times 35 = n$	$\frac{7}{8} \times 560 = n$
16.	$\frac{3}{5} \times 15 = n$	$\frac{3}{4} \times 36 = n$	$\frac{2}{3} \times 24 = n$	$\frac{3}{4} \times 248 = n$
17.	$\frac{2}{3} \times 19 = n$	$\frac{5}{8} \times 52 = n$	$\frac{5}{9} \times 75 = n$	$\frac{2}{3} \times 129 = n$
18.	$\frac{3}{8} \times 27 = n$	$\frac{3}{5} \times 21 = n$	$\frac{3}{8} \times 59 = n$	$\frac{5}{6} \times 365 = n$
19.	$\frac{7}{8} \times 18 = n$	$\frac{2}{3} \times 27 = n$	$\frac{3}{4} \times 43 = n$	$\frac{3}{8} \times 496 = n$

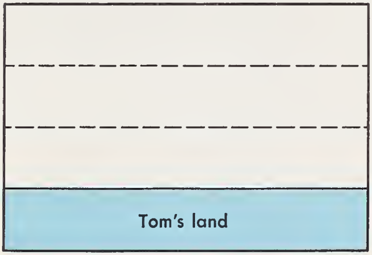
➤ **Extra Practice.** For more practice, work Sets 57 and 58.

Fraction × Fraction

Meaning [O]

1. Tom's father gave him $\frac{1}{4}$ acre of land for a garden of his own. Tom decided to raise potatoes in $\frac{1}{2}$ of his garden. What part of the whole acre did Tom plant with potatoes?

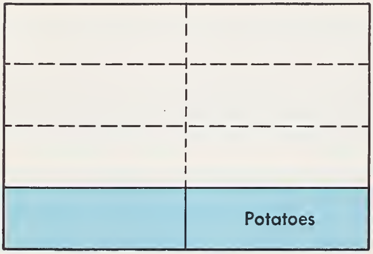
A



The whole acre is shown in picture A. Into how many equal parts is the acre divided? What is the fractional unit?

Tom's piece of land is what part of the acre?

B



Tom planted potatoes in $\frac{1}{2}$ of $\frac{1}{4}$ acre. Then the part in which he planted potatoes is what fractional part of the whole acre? (Use picture B to help you find the answer.)

From picture B, we see that $\frac{1}{2}$ of $\frac{1}{4}$ (or $\frac{1}{2} \times \frac{1}{4}$) = $\frac{1}{8}$.

We can write, "$\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$." The work is done in box C. With figures, how did we find the size of the new fractional unit, $\frac{1}{8}$?

C

$$\frac{1}{2} \times \frac{1}{4} = \frac{1 \times 1}{2 \times 4}, \text{ or } \frac{1}{8}$$

[W]

2. Draw pictures to find

a. $\frac{1}{3} \times \frac{1}{5}$. **b.** $\frac{1}{2} \times \frac{1}{8}$. **c.** $\frac{1}{4} \times \frac{1}{6}$. **d.** $\frac{1}{5} \times \frac{1}{2}$.

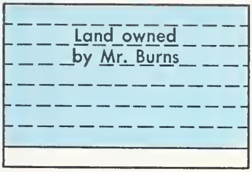
3. Now write with figures the work for finding the products for Ex. 2.

In multiplying a fraction by a fraction, we find the size of the new fractional unit by multiplying the denominators of the given fractions.

[O]

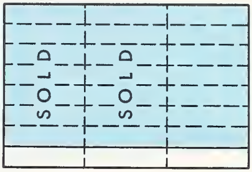
4. Mr. Burns owned $\frac{7}{8}$ acre of land. He sold $\frac{2}{3}$ of it for a house lot. What part of an acre did he sell? $\frac{2}{3} \times \frac{7}{8} = ?$

D



Picture D shows the whole acre and, in blue, the part Mr. Burns owned. What is the fractional unit?

E



Now think of each $\frac{1}{8}$ acre as divided into 3 equal parts, as in E. How many of these parts in the whole acre? The new fractional unit is $\frac{1}{24}$. Mr. Burns sold two $\frac{1}{24}$'s from each of his $\frac{1}{8}$'s. He sold $7 \times \frac{2}{24}$, or $\frac{?}{24}$, of an acre in all. Then $\frac{2}{3}$ of $\frac{7}{8}$ must equal $\frac{?}{24}$, or _?_.

Study box F. With figures, how do we get the new fractional unit? How do we find the total number of equal parts in the new fraction? Explain the work in box F.

F

$$\frac{2}{3} \times \frac{7}{8} = \frac{2 \times 7}{3 \times 8}, \text{ or } \frac{14}{24}, \text{ or } \frac{?}{?}$$

[W]

Find the products, as in box F. Give answers in best form.

	a	b	c	d	e	f
5.	$\frac{2}{3} \times \frac{3}{4}$	$\frac{5}{6} \times \frac{1}{2}$	$\frac{2}{3} \times \frac{3}{8}$	$\frac{1}{8} \times \frac{1}{6}$	$\frac{1}{2} \times \frac{2}{3}$	$\frac{3}{5} \times \frac{1}{8}$
6.	$\frac{1}{6} \times \frac{2}{3}$	$\frac{3}{4} \times \frac{7}{8}$	$\frac{2}{3} \times \frac{3}{5}$	$\frac{3}{8} \times \frac{1}{4}$	$\frac{4}{5} \times \frac{1}{2}$	$\frac{1}{2} \times \frac{5}{8}$
7.	$\frac{3}{4} \times \frac{2}{5}$	$\frac{5}{8} \times \frac{3}{10}$	$\frac{1}{6} \times \frac{9}{10}$	$\frac{3}{4} \times \frac{3}{4}$	$\frac{3}{4} \times \frac{2}{3}$	$\frac{3}{8} \times \frac{4}{5}$
8.	$\frac{1}{2} \times \frac{1}{2}$	$\frac{5}{6} \times \frac{2}{3}$	$\frac{4}{5} \times \frac{5}{12}$	$\frac{2}{3} \times \frac{15}{16}$	$\frac{5}{7} \times \frac{7}{20}$	$\frac{5}{18} \times \frac{9}{10}$
9.	$\frac{3}{4} \times \frac{8}{9}$	$\frac{5}{8} \times \frac{5}{6}$	$\frac{1}{2} \times \frac{7}{8}$	$\frac{8}{15} \times \frac{5}{12}$	$\frac{7}{12} \times \frac{4}{5}$	$\frac{7}{10} \times \frac{5}{8}$

Prove your work for row 5 by making drawings like E.

Extra Practice. For more practice, work Sets 59 and 60.

To find the product of two fractions, we multiply the denominators to get our new fractional unit. We multiply the numerators to find the number of equal parts in the new fraction.

Fraction × Mixed Number

[O]

1. Last year Mr. Knight used $3\frac{3}{4}$ acres of land for potatoes. This year he plans to use only $\frac{2}{3}$ as much, or how many acres?

We can write $3\frac{3}{4}$ as the improper fraction, $\frac{?}{4}$. So this year Mr. Knight plans to use _?_ of $\frac{15}{4}$ acres for potatoes. Explain the work in the box. In best form, the answer is _?_.

$\frac{2}{3} \times 3\frac{3}{4} = \frac{2}{3} \times \frac{15}{4}$, or $\frac{2 \times 15}{3 \times 4}$, or $\frac{30}{12}$, or _?_

Side work
$3\frac{3}{4} = \frac{15}{4}$

[W]

Find products for the following:

2. $\frac{2}{3} \times 2\frac{3}{4}$
3. $\frac{1}{2} \times 1\frac{1}{2}$
4. $\frac{4}{5} \times 2\frac{2}{3}$
5. $\frac{3}{8} \times 1\frac{1}{3}$
6. $\frac{5}{8} \times 5\frac{1}{3}$
7. $\frac{7}{10} \times 1\frac{1}{3}$
8. $\frac{3}{4} \times 2\frac{4}{9}$
9. $\frac{1}{2} \times 4\frac{4}{5}$
10. $\frac{2}{3} \times 5\frac{3}{5}$
11. $\frac{5}{6} \times 4\frac{4}{5}$
12. $\frac{1}{3} \times 2\frac{5}{8}$
13. $\frac{1}{4} \times 2\frac{2}{5}$
14. $\frac{1}{2} \times 3\frac{5}{6}$
15. $\frac{1}{3} \times 10\frac{2}{3}$
16. $\frac{4}{5} \times 3\frac{3}{4}$
17. $\frac{1}{7} \times 5\frac{3}{5}$

Extra Practice. For more practice, work Sets 61 and 62.

You multiply a mixed number by a fraction just as you multiply a fraction by a fraction, first changing the mixed number to an improper fraction.

Multiplying with Fractions

[O]

Tell what you must do to solve each problem, but do not solve it yet.

1. Butter is 60¢ a pound. How much will Mrs. Brown pay for $\frac{3}{4}$ lb.?

HELPER. When Mrs. Brown buys 3 lb., the cost is 3 × \$0.60. When she buys $\frac{3}{4}$ lb., the cost is $\frac{3}{4}$ × \$0.60.

2. Sam had 35 papers to sell. He sold $\frac{2}{5}$ of them before lunch. How many papers did he sell before lunch?

3. After Christmas a card store marked its 15¢ cards down to $12\frac{1}{2}$¢. How much did Mary pay for 7 of these cards?

HELPER. In figuring a selling price, we round any fraction of a cent in the answer to the next larger whole cent.

4. Miss Pike said that $\frac{7}{8}$ of the class had perfect attendance for the first two months. The total number enrolled in the class was 40. How many pupils had perfect attendance during these two months?

5. Between 8 o'clock and 2 o'clock Jack had ridden on his bicycle 3 times the distance from his house to Sam's. The boys once measured the distance and found that it was $2\frac{1}{2}$ mi. How far did Jack ride between 8 o'clock and 2 o'clock?

6. Betty and Sue earned money by shelling $2\frac{1}{4}$ lb. of nuts each day for 5 days. How many pounds of nuts did they shell in that time?

7. Barbara worked on her music lesson $\frac{3}{4}$ hr. each day. In 6 days, how much time did she put on her music?

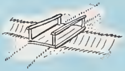
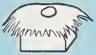
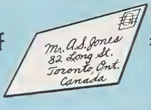
8. Bob earned 60¢ an hour working after school. In $\frac{2}{3}$ hr. after school, how much did he earn?

[W]

Now write out your work to find the answers.

Mystery Chef

A game with fractions [W]

$\frac{2}{6}$ of  + $\frac{1}{3}$ of  + $\frac{2}{7}$ of  = ?

Mr. A.S. Jones
82 Long St.
Toronto, Ont.
Canada

A cook uses some unusual materials to make a special dessert. To learn what the dessert is, use boxes A, B, and C, below. First look at the box above and study these directions for finding the word that is represented there:

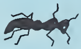
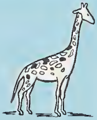
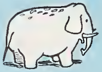
The denominator of each fraction gives the number of letters in the name of the thing pictured. The numerator tells the number of letters used from the beginning of the word.

For example, from the box above,

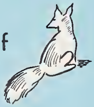
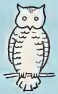
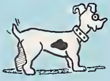
$\frac{2}{6}$ of bridge + $\frac{1}{3}$ of egg + $\frac{2}{7}$ of address = br e ad.

The name of the special dessert contains three words. The first word can be found in box A; the second, in box B; and the third, in box C.

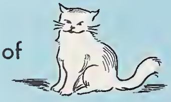
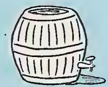
A

$\frac{2}{3}$ of  + $\frac{1}{7}$ of  + $\frac{2}{8}$ of  = ?

B

$\frac{2}{3}$ of  + $\frac{1}{3}$ of  + $\frac{1}{3}$ of  = ?

C

$\frac{2}{3}$ of  + $\frac{2}{3}$ of  = ?

With permission *Boston Sunday Herald*

Problems in Measurement

[W]

Write your work for these problems:

1. A bushel of peas will fill how many 2-quart bags?

2. The weights of 5 boys were 79$\frac{1}{2}$ lb., 86 lb., 91$\frac{1}{4}$ lb., 83 lb., and 95$\frac{1}{4}$ lb. Find their average weight.

3. Change 145 minutes to hours and minutes.

4. Joe ran $\frac{3}{5}$ of a mile. How many feet was that?

5. A living room is 26 feet long and 17 feet wide. How many square yards of rug material will be needed to cover the entire floor?

Mixed Practice

[W]

Copy and do as the signs say. Check your answers.

	a	b	c	d	e	f
1.	273	8,963	755	3,806	$95.57	$63.07
	5,786	3,826	4,513	7,712	84.26	5.73
	958	859	1,668	59	0.75	98.95
	+675	+407	+268	+942	+4.65	+2.61
2.	768	4,059	20,061	70,350	$73.42	$40.06
	−397	−2,673	−2,581	−3,876	−50.79	−2.79
3.	630	9,841	2,308	8,002	$6.37	$8.05
	×27	×76	×706	×410	×28	×27

Write any remainder in a fraction.

4. 8)648 7)3,563 4)3,128 5)9,074 6)$9.36 9)$18.27

5. 6)3,603 9)7,205 7)4,289 8)4,480 4)$20.80 26)$49.14

Be sure that you can say the M. and D. facts on pages 293 and 294.

Progress in Multiplying with Fractions

Summary of the 8 kinds of example [**O**]

In multiplying with fractions, you have been using two kinds of multipliers. In one kind of example, the multiplier was a whole number; in the other, it was a fraction.

1. $5 \times \frac{3}{10} = ?$ is an example in which the multiplier is a whole number and the multiplicand is a fraction. Give three more examples of this kind.

2. Use $5 \times \frac{3}{10} = ?$ to tell how you work such an example.

3. Give an example in which the multiplier is a whole number and the multiplicand is a mixed number.

4. $6 \times 2\frac{1}{4} = ?$ Tell how to work this example by
a. changing $2\frac{1}{4}$ to an improper fraction; **b.** multiplying parts.

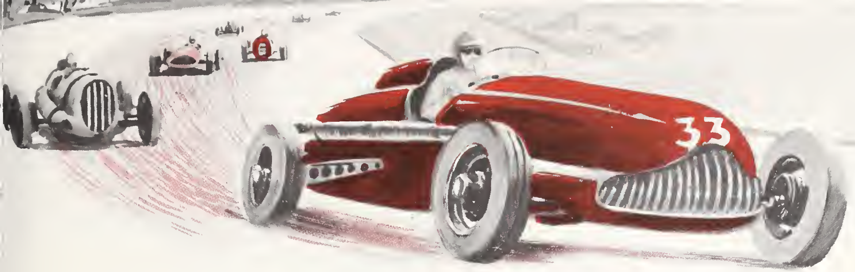
5. Now write on the board and tell how to work an example with a fraction multiplier and a multiplicand which is
a. a whole number; **b.** a fraction; **c.** a mixed number.

There is another kind of example in multiplying with fractions. In this kind the multiplier is a mixed number.

6. Study the boxes at the right. They list all the kinds of multiplication examples with fractions. Find the box which names the multiplier as a mixed number. The box at its right shows how many kinds of multiplicands you can have with a mixed-number multiplier.

Multiplier	**Multiplicand**
I. Whole Number	a. Fraction b. Mixed Number
II. Fraction	a. Whole Number b. Fraction c. Mixed Number
III. Mixed Number	a. Whole Number b. Fraction c. Mixed Number

The next pages will show you how to work examples when the multiplier is a mixed number.



Multiplying by a Mixed Number

Multiplicand a whole number [O]

1. At the end of an automobile race, car 33 was $3\frac{1}{2}$ laps ahead of car 52. The length of one lap was 5 miles. Car 33 was how many miles ahead of car 52?

It is easy to multiply a whole number by a mixed number if you think of the mixed number in parts. Explain box A.

Also you can find the answer in the fraction way. To what fraction can you change $3\frac{1}{2}$? Explain the work in box B.

A

$$\begin{array}{rl} 5 & \\ \times 3\frac{1}{2} & \\ \hline 2\frac{1}{2} & (\frac{1}{2} \times 5) \\ 15 & (3 \times 5) \\ \hline 17\frac{1}{2} & \end{array}$$

B

$$3\tfrac{1}{2} \times 5 = \frac{7}{2} \times 5, \text{ or } \frac{7 \times 5}{2}, \text{ or } \frac{35}{2}, \text{ or } 17\tfrac{1}{2}$$

Side work

$3\frac{1}{2} = \frac{7}{2}$

[W]

Work these examples both ways, as in boxes A and B:

	a	b	c	d	e
2.	$4\frac{1}{3} \times 7$	$5\frac{2}{3} \times 6$	$4\frac{1}{5} \times 16$	$6\frac{1}{3} \times 14$	$7\frac{1}{2} \times 23$
3.	$2\frac{1}{2} \times 4$	$7\frac{3}{4} \times 9$	$3\frac{1}{8} \times 25$	$5\frac{1}{2} \times 28$	$8\frac{1}{3} \times 15$
4.	$3\frac{1}{4} \times 8$	$2\frac{1}{4} \times 17$	$2\frac{3}{5} \times 7$	$4\frac{2}{3} \times 9$	$4\frac{1}{2} \times 45$

Extra Practice. For more practice, work Sets 63 and 64.

To multiply a whole number by a mixed number, either multiply by the parts of the mixed number; or change the mixed number to an improper fraction and multiply by the fraction.

Multiplying by a Mixed Number

Multiplicand a fraction [O]

1. John spent $\frac{3}{5}$ hr. on his homework. Alan spent $2\frac{1}{2}$ times as many hours on his, or _?_ hours. $2\frac{1}{2} \times \frac{3}{5} = ?$

We can change $2\frac{1}{2}$, the multiplier, to $\frac{5}{2}$ (box A). Now the example is like which kind of example you have had?

In box A study the short way to multiply $\frac{5}{2} \times \frac{3}{5}$. What step has been left out? Explain all the work in box A.

A

$$2\frac{1}{2} \times \frac{3}{5} = \frac{5}{2} \times \frac{3}{5}, \text{ or } \frac{5 \times 3}{2 \times 5}, \text{ or } \frac{15}{10}, \text{ or } 1\frac{5}{10}, \text{ or } 1\frac{1}{2}$$

Short way: $\frac{5}{2} \times \frac{3}{5} = \frac{15}{10}$, or $1\frac{5}{10}$, or $1\frac{1}{2}$

B

$$4\frac{1}{2} \times 1\frac{1}{2} = \frac{9}{2} \times \frac{3}{2}, \text{ or } \frac{27}{4}, \text{ or } 6\frac{3}{4}$$

Side work

$4\frac{1}{2} = \frac{9}{2}$ $1\frac{1}{2} = \frac{3}{2}$

Multiplicand a mixed number

2. A tractor uses $1\frac{1}{2}$ gal. of gasoline an hour. How many gallons will it use in $4\frac{1}{2}$ hr.? $4\frac{1}{2} \times 1\frac{1}{2} = ?$

What must we do before we can multiply? Explain the work in box B. Then, to check, work the example on the board, reversing the factors. Do you get the same answer as in box B?

[W]

Multiply in rows 3–7. Write your work the short way. In row 7, check by reversing the factors and multiplying again.

	a	b	c	d	e
3.	$2\frac{5}{8} \times \frac{1}{3}$	$4\frac{2}{3} \times \frac{1}{4}$	$4\frac{5}{6} \times \frac{2}{5}$	$1\frac{2}{3} \times \frac{3}{4}$	$4\frac{1}{2} \times \frac{5}{8}$
4.	$6\frac{2}{3} \times \frac{3}{5}$	$3\frac{1}{3} \times \frac{7}{10}$	$2\frac{2}{5} \times \frac{11}{4}$	$2\frac{3}{4} \times \frac{1}{2}$	$4\frac{1}{3} \times \frac{2}{3}$
5.	$6\frac{1}{4} \times \frac{4}{5}$	$3\frac{2}{3} \times \frac{3}{5}$	$1\frac{4}{5} \times \frac{5}{8}$	$3\frac{1}{4} \times 1\frac{2}{3}$	$2\frac{1}{2} \times 1\frac{3}{4}$
6.	$2\frac{1}{10} \times 2\frac{1}{4}$	$3\frac{1}{3} \times 5\frac{3}{5}$	$1\frac{2}{3} \times 2\frac{5}{8}$	$4\frac{1}{8} \times 2\frac{1}{2}$	$8\frac{4}{5} \times 7\frac{1}{2}$
7.	$1\frac{3}{8} \times 6\frac{2}{9}$	$2\frac{1}{3} \times 2\frac{1}{3}$	$3\frac{1}{3} \times 2\frac{1}{4}$	$1\frac{1}{5} \times 1\frac{3}{8}$	$5\frac{1}{5} \times 4\frac{3}{8}$

▶ **Extra Practice.** For more practice, work Sets 65–67.

Some Multiplication Problems

[W]

Write and work the multiplication example for each problem.

1. On the average, Mr. Beal's sheep yield $6\frac{1}{2}$ lb. of wool each. How much wool will 10 sheep yield?

2. Each of 144 packages in a carton contains $\frac{3}{4}$ lb. of soap flakes. How many pounds of soap flakes does the carton contain?

3. The lead from old storage batteries is melted and made into $2\frac{1}{2}$-pound chunks. One day a salvage company made 1,387 chunks. That was how many pounds of lead?

4. Bill sold a 3-pound chicken at $27\frac{1}{2}$¢ a pound. How much money should he receive?

5. It is $\frac{6}{10}$ mi. from Bob's house to school. When he has walked $\frac{2}{3}$ of the way, how far has he walked?

6. A $2\frac{1}{2}$-gallon can contains how much water when $\frac{2}{3}$ full?

7. The radio announcer said that the stadium was $\frac{3}{4}$ full. If it seats 56,000, about how many people were in the seats?

8. Mrs. Dean bought $2\frac{3}{4}$ yd. of lace for trimming at 20¢ a yard. How much did she pay for it?

9. At the market, cube steaks weigh about $\frac{3}{8}$ lb. Mrs. West bought 4 of them. How much did they weigh in all?

10. How many square feet of glass are there in a picture window $3\frac{1}{2}$ ft. long and $1\frac{5}{6}$ ft. high?

A Short Cut—Cancellation

Meaning [O]

1. $\frac{5}{9} \times \frac{2}{5} = \frac{5 \times 2}{9 \times 5} = \frac{10}{45}$. By what number will you divide both terms of $\frac{10}{45}$ to change the answer to best form? $\frac{10}{45} = \frac{?}{?}$

2. Box A shows an easier way to work Ex. 1. When we look at the fractions to be multiplied, we see right away that their product will have 5 as a factor of both the numerator and the denominator. Then we can divide both terms by 5 *before* we multiply. To show that we are dividing by 5, we cross out, or cancel, the 5's. Then we multiply as usual the numbers that are left, 9 × 1 for the denominator and 1 × 2 for the numerator. What is the product? Is the answer in best form?

A

$$\frac{\overset{1}{\cancel{5}}}{9} \times \frac{2}{\underset{1}{\cancel{5}}} = \frac{2}{9}$$

B

$$\frac{\overset{1}{\cancel{6}}}{\underset{1}{\cancel{7}}} \times \frac{\overset{1}{\cancel{7}}}{\underset{2}{\cancel{12}}} = \frac{1}{2}$$

C

$$\frac{\overset{3}{\cancel{9}}}{\underset{8}{\cancel{16}}} \times \frac{\overset{7}{\cancel{14}}}{\underset{5}{\cancel{15}}} = \frac{21}{40}$$

3. Box B. Explain what the cancellation of the 7's means. By what other number have we divided both a numerator and a denominator? Explain all the work. The product is _?_.

4. Explain the cancellation in box C. How do we use the Golden Rule of Fractions when we cancel?

Cancellation is a way of reducing fractions before they are multiplied.

Tell whether you can cancel before multiplying in these:

	a	b	c	d	e	f
5.	$\frac{1}{3} \times \frac{4}{5}$	$\frac{1}{10} \times \frac{2}{3}$	$\frac{1}{5} \times \frac{15}{16}$	$\frac{7}{8} \times \frac{3}{14}$	$\frac{4}{5} \times \frac{7}{8}$	$\frac{1}{9} \times \frac{3}{10}$
6.	$\frac{1}{4} \times \frac{2}{7}$	$\frac{2}{5} \times \frac{7}{9}$	$\frac{1}{8} \times \frac{4}{15}$	$\frac{3}{5} \times \frac{7}{8}$	$\frac{1}{6} \times \frac{8}{15}$	$\frac{2}{3} \times \frac{9}{14}$
7.	$\frac{1}{2} \times \frac{7}{8}$	$\frac{2}{3} \times \frac{9}{10}$	$\frac{2}{7} \times \frac{14}{15}$	$\frac{9}{10} \times \frac{3}{4}$	$\frac{5}{6} \times \frac{9}{10}$	$\frac{3}{5} \times \frac{5}{12}$

[W]

Now multiply in rows 5–7, using cancellation.

Using Cancellation

[W]

Multiply. Use cancellation when you can.

A whole number as multiplier

	a	b	c	d	e
1.	$35 \times \frac{1}{2}$	$27 \times \frac{1}{6}$	$16 \times \frac{1}{3}$	$21 \times 2\frac{1}{3}$	$14 \times \frac{3}{5}$
2.	$60 \times \frac{7}{10}$	$30 \times \frac{5}{9}$	$15 \times 1\frac{4}{5}$	$12 \times \frac{3}{16}$	$8 \times \frac{7}{12}$
3.	$2 \times \frac{3}{8}$	$6 \times \frac{11}{12}$	$4 \times \frac{7}{16}$	$3 \times \frac{5}{12}$	$4 \times \frac{2}{9}$

A fraction as multiplier

	a	b	c	d	e
4.	$\frac{3}{10} \times \frac{2}{5}$	$\frac{2}{5} \times \frac{7}{4}$	$\frac{3}{16} \times \frac{4}{9}$	$\frac{8}{3} \times \frac{3}{2}$	$\frac{5}{4} \times \frac{8}{3}$
5.	$\frac{2}{9} \times \frac{3}{5}$	$\frac{5}{16} \times \frac{8}{15}$	$\frac{7}{10} \times 2$	$\frac{1}{6} \times \frac{6}{5}$	$\frac{2}{3} \times 1\frac{7}{10}$
6.	$\frac{7}{8} \times \frac{4}{5}$	$\frac{3}{7} \times \frac{5}{6}$	$\frac{6}{7} \times 4\frac{2}{3}$	$\frac{3}{16} \times 2\frac{2}{5}$	$\frac{7}{16} \times 3\frac{1}{5}$
7.	$\frac{2}{15} \times \frac{5}{6}$	$\frac{5}{12} \times 7\frac{1}{2}$	$\frac{9}{4} \times 2$	$\frac{5}{3} \times 2\frac{7}{10}$	$\frac{15}{2} \times 3$
8.	$\frac{8}{9} \times \frac{3}{4}$	$\frac{5}{16} \times 2\frac{2}{5}$	$\frac{7}{6} \times 4$	$\frac{3}{4} \times \frac{5}{8}$	$\frac{7}{9} \times \frac{12}{7}$

A mixed number as multiplier

	a	b	c	d	e
9.	$2\frac{1}{2} \times \frac{4}{5}$	$2\frac{1}{6} \times \frac{3}{8}$	$3\frac{1}{7} \times \frac{1}{2}$	$1\frac{1}{5} \times 2\frac{1}{12}$	$2\frac{2}{5} \times \frac{1}{4}$
10.	$1\frac{7}{8} \times \frac{2}{10}$	$1\frac{1}{3} \times \frac{3}{16}$	$2\frac{2}{9} \times 2$	$4\frac{1}{2} \times \frac{1}{6}$	$1\frac{1}{6} \times \frac{3}{10}$
11.	$1\frac{4}{5} \times 3\frac{1}{3}$	$1\frac{1}{5} \times \frac{7}{12}$	$4\frac{1}{6} \times \frac{2}{5}$	$1\frac{1}{2} \times 4$	$3\frac{1}{3} \times 3$

12. A package of crackers marked "Contents, $\frac{3}{4}$ lb." is half full. What is the weight of the crackers in it now?

13. What will $\frac{3}{4}$ yd. of ribbon cost at 40¢ a yard?

14. How much will $\frac{2}{3}$ of a $10\frac{1}{2}$-pound cheese weigh?

15. Since 1 rod (rd.) = $5\frac{1}{2}$ yd., how many yards are there in 12 rd.?

16. How many ounces of candy are there in a $5\frac{1}{2}$-pound chocolate egg?

17. At $7\frac{1}{2}$¢ a yard, how much would Mrs. Wallace pay for 24 yd. of lace?

Extra Practice. For more practice, work Sets 68–70.

Multiplying with More than Two Factors

[O]

Now that you know how to find the product of two fractions and how to use cancellation, you can easily find the product of three or more fractions.

A

$$\frac{5}{7} \times \frac{1}{2} \times \frac{3}{4} = \frac{15}{56}$$

B

$$\frac{\overset{1}{\cancel{4}}}{\underset{1}{\cancel{5}}} \times \frac{\overset{3}{\cancel{9}}}{\underset{4}{\cancel{16}}} \times \frac{\overset{1}{\cancel{5}}}{\underset{4}{\cancel{12}}} = \frac{3}{16}$$

1. Study the work in box A. Can you cancel? Explain how to find the product.

2. Explain all the work in box B. To check, work the example on the board without using cancellation.

[W]

Copy and find **n** in rows 3 and 4. Cancel when you can.

	a	b	c
3.	$\frac{1}{5} \times \frac{1}{4} \times \frac{2}{3} = n$	$\frac{1}{2} \times \frac{3}{8} \times \frac{4}{5} = n$	$\frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} = n$
4.	$\frac{8}{9} \times \frac{3}{4} \times \frac{2}{5} = n$	$\frac{7}{8} \times \frac{4}{5} \times \frac{10}{21} = n$	$\frac{3}{5} \times \frac{2}{9} \times \frac{15}{16} \times \frac{4}{7} = n$

5. For the example $4 \times \frac{9}{16} \times 2\frac{1}{3}$, you can multiply just as in boxes A and B. When one of the factors in an example of this kind is a fraction, it is better to write all the factors in fraction form before you multiply. Remember that any whole number can be written as a fraction with the denominator 1, and that any mixed number can be written as an improper fraction. Then this example becomes $\frac{4}{1} \times \frac{9}{16} \times \frac{7}{3}$. Work the example on your paper. (Don't forget to cancel!)

Change whole and mixed numbers to fractions and find **n.**

6.	$\frac{3}{4} \times \frac{5}{8} \times 2\frac{1}{6} = n$	$\frac{3}{10} \times \frac{5}{9} \times 10 = n$	$\frac{1}{2} \times \frac{2}{9} \times 7 \times 6 = n$
7.	$2\frac{1}{4} \times \frac{2}{3} \times \frac{5}{6} = n$	$\frac{5}{6} \times 1\frac{4}{5} \times \frac{2}{3} = n$	$\frac{5}{8} \times 3\frac{1}{5} \times 4 \times \frac{3}{4} = n$
8.	$\frac{3}{4} \times \frac{4}{7} \times 3\frac{1}{2} = n$	$3\frac{1}{7} \times \frac{3}{4} \times 21 = n$	$\frac{7}{12} \times 5 \times \frac{6}{7} \times 2\frac{4}{5} = n$

➤ **Extra Practice.** For more practice, work Set 71.

Short Answer Test

[W]

One of the answers in parentheses after each example is correct. For each example, write the answer you think is correct.

1. $\frac{1}{2}+\frac{3}{4}$ $(\frac{4}{6})$ $(1\frac{1}{4})$ $(\frac{3}{8})$

2. $\frac{7}{8}+\frac{2}{3}$ $(\frac{9}{11})$ $(1\frac{1}{8})$ $(1\frac{13}{24})$

3. $4-1\frac{3}{4}$ $(3\frac{3}{4})$ $(2\frac{1}{4})$ $(3\frac{1}{4})$

4. $6\frac{5}{8}-2\frac{1}{2}$ $(4\frac{1}{8})$ $(4\frac{1}{2})$ $(4\frac{1}{4})$

5. $3\times\frac{7}{8}$ $(2\frac{5}{8})$ $(\frac{7}{24})$ $(3\frac{7}{8})$

6. $5\times\frac{3}{4}$ $(5\frac{3}{4})$ $(3\frac{3}{4})$ $(1\frac{1}{4})$

7. $4\times3\frac{1}{2}$ (14) $(12\frac{1}{2})$ $(7\frac{1}{2})$

8. $\frac{4}{5}\times2\frac{3}{4}$ $(1\frac{6}{5})$ $(8\frac{1}{2})$ $(2\frac{1}{5})$

9. How many partial products are there when we multiply 25×426? (1) (2) (3)

10. What is the first partial dividend in the division example $43\overline{)36{,}195}$? (36) (361) (3619)

11. What is the smallest common denominator for $\frac{2}{3}+\frac{4}{5}+\frac{1}{2}$? (10) (15) (30)

12. Which of the fractions in Ex. 11 is smallest? $(\frac{1}{2})$ $(\frac{4}{5})$ $(\frac{2}{3})$

Written Practice

	a	b	c	d	e	f
1.	$\frac{3}{4}$ $+\frac{1}{5}$	$4\frac{5}{8}$ $+6\frac{3}{16}$	$3\frac{7}{8}$ $+5\frac{2}{3}$	$6\frac{1}{2}$ $-2\frac{1}{4}$	7 $-3\frac{4}{5}$	$4\frac{1}{6}$ $-3\frac{1}{2}$
2.	56 +97	498 +307	293 +146	301 −92	652 −148	600 −518
3.	72 ×30	65 ×83	78 ×96	305 ×806	38 ×27	401 ×260

Write any remainder with R.

4. $26\overline{)832}$ **5.** $19\overline{)6{,}035}$ **6.** $82\overline{)32{,}895}$

7. Change to improper fractions: $6\frac{1}{2}$; $4\frac{2}{3}$; $7\frac{3}{4}$; $5\frac{3}{8}$.

8. Change to best form: $\frac{17}{5}$; $\frac{14}{16}$; $\frac{9}{12}$; $\frac{23}{7}$; $\frac{16}{24}$; $\frac{14}{6}$; $\frac{31}{8}$; $\frac{5}{10}$.

A Discovery about Products

Size of product related to size of multiplier [O]

1. Check each product in the box below. You will need to work Ex. b, c, g, and h on the board because some steps are not shown, but you can check the other products "in your head."

2. In Ex. a, the multiplier is less than 1. The product is _?_ (the same as, more than, less than) the multiplicand.

3. In Ex. d, the multiplier is _?_. The product is _?_ (the same as, more than, less than) the multiplicand.

4. In Ex. f, the multiplier is _?_ than 1. The product is _?_ (the same as, more than, less than) the multiplicand.

5. Read each of Ex. a–h and tell why the product is more than, less than, or the same as the multiplicand.

Multiplier × Multiplicand = Product	Size of Multiplier	Size of Product
a. $\frac{4}{5} \times \frac{5}{8} = \frac{20}{40}$, or $\frac{1}{2}$	Less than 1	Less than $\frac{5}{8}$
b. $\frac{1}{4} \times 6 = \frac{3}{2}$, or $1\frac{1}{2}$	Less than 1	Less than 6
c. $\frac{3}{4} \times 2\frac{1}{2} = \frac{15}{8}$, or $1\frac{7}{8}$	Less than 1	Less than $2\frac{1}{2}$
d. $1 \times \frac{3}{4} = \frac{3}{4}$	1	Equal to $\frac{3}{4}$
e. $1 \times 4\frac{1}{2} = 4\frac{1}{2}$	1	Equal to $4\frac{1}{2}$
f. $3 \times \frac{1}{2} = \frac{3}{2}$, or $1\frac{1}{2}$	More than 1	More than $\frac{1}{2}$
g. $1\frac{1}{4} \times 4 = 5$	More than 1	More than 4
h. $2\frac{1}{3} \times 1\frac{1}{2} = \frac{7}{2}$, or $3\frac{1}{2}$	More than 1	More than $1\frac{1}{2}$

If the multiplier is less than 1, the product will be less than the multiplicand.

If the multiplier is 1, the product will be equal to the multiplicand.

If the multiplier is more than 1, the product will be more than the multiplicand.

For each example in rows 6–8, tell whether the product, **n**, will be less than, equal to, or more than the multiplicand.

	a	b	c	d	e
6.	$\frac{1}{4} \times 8 = n$	$\frac{2}{3} \times \frac{7}{8} = n$	$4 \times \frac{1}{3} = n$	$1 \times 4\frac{5}{6} = n$	$1\frac{1}{2} \times \frac{1}{3} = n$
7.	$5 \times \frac{2}{3} = n$	$2\frac{1}{2} \times 4 = n$	$\frac{3}{4} \times 1\frac{7}{8} = n$	$\frac{4}{5} \times 7 = n$	$3\frac{3}{4} \times \frac{1}{2} = n$
8.	$4\frac{1}{2} \times \frac{3}{4} = n$	$1 \times \frac{7}{8} = n$	$1\frac{2}{3} \times 6 = n$	$2\frac{1}{2} \times \frac{3}{4} = n$	$2 \times 1\frac{3}{4} = n$

[W]

Now go back and find **n** in each example.

Rounding Mixed Numbers

[O]

1. Each of the fractions $\frac{4}{8}$, $\frac{5}{10}$, and $\frac{3}{6}$ equals $\frac{1}{2}$. In each fraction, does the numerator equal $\frac{1}{2}$ of the denominator, more than $\frac{1}{2}$ of the denominator, or less than $\frac{1}{2}$ of the denominator?

2. Each of the fractions $\frac{9}{16}$, $\frac{7}{12}$, and $\frac{5}{8}$ equals more than $\frac{1}{2}$. Does each numerator equal $\frac{1}{2}$ of the denominator, more than $\frac{1}{2}$ of the denominator, or less than $\frac{1}{2}$ of the denominator?

3. Each of the fractions $\frac{2}{5}$, $\frac{3}{8}$, and $\frac{4}{10}$ equals less than $\frac{1}{2}$. Does each numerator equal $\frac{1}{2}$ of the denominator, more than $\frac{1}{2}$ of the denominator, or less than $\frac{1}{2}$ of the denominator?

To tell whether a fraction is less than or equal to or more than $\frac{1}{2}$, compare its numerator with $\frac{1}{2}$ of its denominator.

4. Tell whether each of these fractions is less than, equal to, or greater than $\frac{1}{2}$: $\frac{3}{8}$; $\frac{7}{14}$; $\frac{5}{7}$; $\frac{7}{16}$; $\frac{3}{5}$; $\frac{8}{16}$; $\frac{5}{12}$; $\frac{6}{11}$; $\frac{4}{9}$.

5. To round $7\frac{5}{8}$ to the nearest whole number, we *think*, "$\frac{5}{8}$ is more than $\frac{1}{2}$, so the whole number nearest to $7\frac{5}{8}$ is _?_."

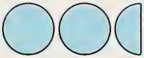
6. Tell what to think in rounding $8\frac{2}{5}$ to the nearest whole number; in rounding $5\frac{6}{7}$; in rounding $3\frac{7}{10}$; in rounding $9\frac{1}{3}$.

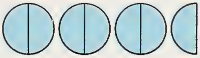
7. When the fraction in a mixed number is $\frac{1}{2}$, is there any "nearest whole number"? Would you round $8\frac{1}{2}$ to 8 or to 9?

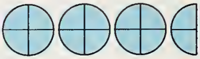
So You Won't Forget!

[O]

1. Which of these drawings shows the mixed number $2\frac{1}{2}$?

a.


b.


c.


2. In multiplying 731 and 43 which number would you use for the multiplier?

3. Is $\frac{2}{3}$ of 12 the same as $\frac{2}{3} \times 12$?

4. Will the product of $24 \times 2\frac{7}{8}$ be more than or less than the product of 24×3?

5. Will the product of $\frac{7}{8} \times 1\frac{5}{6}$ be more than or less than $1\frac{5}{6}$?

6. What is a common denominator for $\frac{5}{8}$ and $\frac{2}{3}$?

7. In multiplying $2\frac{3}{4}$ by $1\frac{1}{2}$, what changes would you make before multiplying?

8. Which fractions are greater than $\frac{1}{2}$? $\frac{3}{8}$ $\frac{7}{9}$ $\frac{5}{8}$ $\frac{3}{6}$

9. Estimate the product of $6\frac{1}{2} \times 10\frac{7}{8}$.

Practice in Multiplying with Fractions

[W]

	a	b	c	d
1.	$\frac{1}{2} \times 16$	$\frac{2}{3} \times 8$	$8 \times \frac{3}{4}$	$9 \times \frac{5}{6}$
2.	$4\frac{1}{2} \times 8$	$3 \times 16\frac{2}{3}$	$\frac{1}{2} \times \frac{3}{4}$	$\frac{7}{8} \times \frac{2}{3}$
3.	$1\frac{3}{4} \times \frac{1}{6}$	$6\frac{1}{2} \times \frac{2}{3}$	$\frac{7}{8} \times 4\frac{1}{2}$	$1\frac{1}{5} \times 4$
4.	$2\frac{1}{2} \times 2\frac{1}{2}$	$3\frac{1}{4} \times 1\frac{1}{2}$	$6\frac{1}{4} \times 1\frac{2}{3}$	$7\frac{1}{8} \times 2\frac{1}{3}$
5.	$6\frac{1}{4} \times 2\frac{1}{3}$	$1\frac{5}{6} \times 2\frac{4}{5}$	$4\frac{1}{3} \times 1\frac{2}{3}$	$\frac{3}{4} \times 2\frac{1}{5}$

	a	b	c	d	e	f
6.	$80\frac{1}{2}$ $\times 6$	$96\frac{3}{4}$ $\times 8$	$70\frac{1}{2}$ $\times 3$	$50\frac{1}{2}$ $\times 12$	$23\frac{2}{3}$ $\times 6$	$14\frac{1}{2}$ $\times 8$
7.	16 $\times 4\frac{1}{2}$	42 $\times 8\frac{3}{4}$	54 $\times 4\frac{2}{3}$	21 $\times 5\frac{1}{8}$	36 $\times 6\frac{4}{5}$	14 $\times 7\frac{3}{4}$

Does the Answer Make Sense?

Testing the answer [O]

Often you can use the things you know about estimating and about the size of products to help you decide whether or not your answer to a multiplication example makes sense.

1. For $\frac{6}{7} \times 4\frac{2}{3}$, will the product be more than or less than $4\frac{2}{3}$? How can you tell? Do you think 4 is a reasonable answer?

2. For $3\frac{1}{3} \times \frac{3}{4}$, John got the answer $4\frac{1}{4}$. Just by looking at the two factors that are multiplied, you can tell that this is not a reasonable answer. Explain.

3. A large package of dry cereal weighs $\frac{7}{8}$ lb. Nancy said, "Ten of these packages will weigh about 12 pounds." How can you tell right away that her answer was too large?

4. If either of two factors is less than 1, why is their product less than the other factor?

5. Claire earned \$9. She had $\frac{1}{5}$ of it left after buying Christmas presents. Her brother Joe said, "You must have about \$$2\frac{1}{2}$ left." Does Joe's estimate make sense? Explain.

HELPER. *Think*, "$\frac{1}{5}$ of \$10 = \$2; \$9 is less than \$10, so $\frac{1}{5}$ of \$9 must be _?_ than \$2."

6. Tony's answer for the example $5\frac{3}{4} \times 6$ was $30\frac{1}{2}$. To test this answer, think whether the product should be nearer to 6×6, or 36, or to 5×6, or 30. How can you tell? Is Tony's answer nearer to 36 or to 30? Is it a sensible answer? How do you know that the product should not be *more* than 36?

7. Why is 75 not a reasonable answer for $9 \times 7\frac{1}{3}$?

HELPER. How can you use the M. fact $9 \times 8 = 72$?

8. For $5\frac{2}{3} \times 3\frac{1}{4}$, Don got the answer $10\frac{1}{12}$. Is this a reasonable answer? How would it have helped Don if he had rounded each factor to the nearest whole number and found an estimated product before he worked the example?

At Zeno's

Estimating answers **[O]**

Tell which estimate after each problem seems best, and why.

1. At the Zeno Fruit Stand, the average weight of a seedless grapefruit is $1\frac{1}{4}$ lb. What would you expect 16 of these grapefruit to weigh? $16\frac{1}{4}$ lb. 160 lb. 20 lb.

2. On the counter Mrs. Parks displayed $\frac{1}{2}$ of a grapefruit to show how good the fruit was. She gave Jim $\frac{1}{2}$ of the half grapefruit to taste. What part of a whole grapefruit did Jim get? $\frac{1}{2}$ $\frac{1}{4}$ $\frac{2}{2}$, or 1

3. If tangerines weigh $\frac{1}{4}$ lb. each, on the average, about how much will a dozen of them weigh? 48 lb. 3 lb. 16 lb.

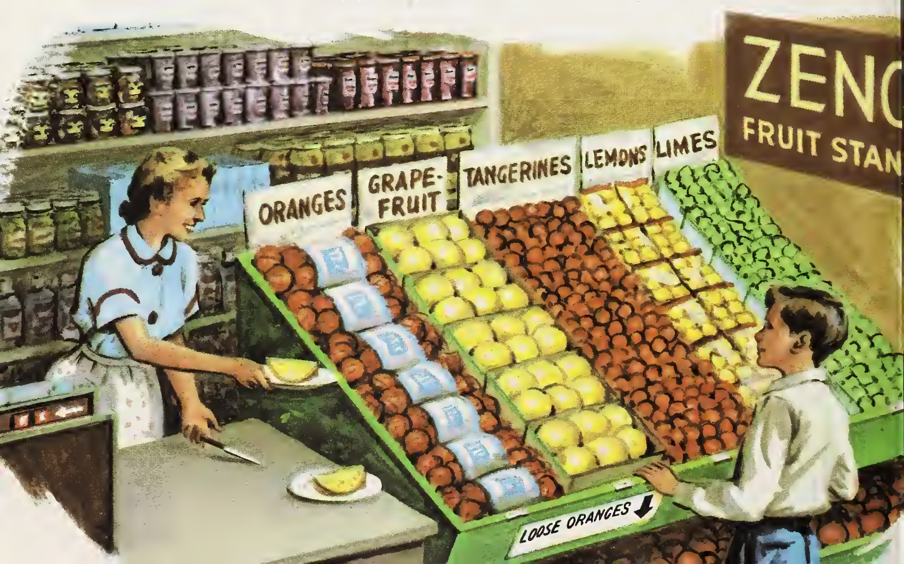
4. At the Zeno stand, Temple oranges are \$3 a bushel. How much will Jim pay for 3 pecks ($\frac{3}{4}$ bu.)? \$9 \$12 \$2

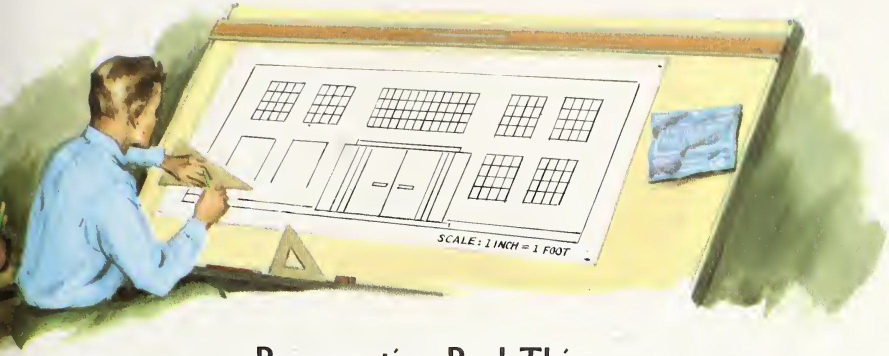
5. Mrs. Parks sells pecans at $\$\frac{1}{2}$ a pound. Alice bought $1\frac{1}{2}$ lb. How much should she pay? $\$\frac{3}{4}$ \$2 $\$1\frac{1}{4}$

6. Mr. James bought $3\frac{1}{2}$ lb. of orange-blossom honey. Now he has $\frac{1}{4}$ of it left. How many pounds are left? $2\frac{1}{2}$ 3 1

[W]

Now go back and write your work for each problem.





Representing Real Things

Meaning of scale [O]

1. The drawing above shows the front of a building 38 ft. long and 18 ft. high. The draftsman wanted his drawing to be the same shape as the front of the real building, with every part accurately placed, so he used a **scale**—that is, he let 1 inch in his drawing stand for 1 foot in the real building. Then his drawing is _?_ in. long and _?_ in. high. We call this a **scale drawing** to the scale *1 in. = 1 ft.*

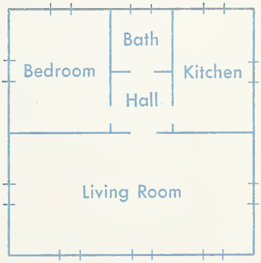
2. Suppose the draftsman had used the scale *1 in. = 6 ft.* Then, since every inch in the drawing would stand for 6 ft. in the building, the drawing would be as many inches high as there are 6's in 18, or _?_ in.

3. How long would the drawing be if the draftsman used the scale 1 in. = 6 ft.? (38 ÷ 6 = ?)

4. The floor plan at the right is also a scale drawing. What is the scale?

5. Find the dimensions of the living room. HELPER. On the plan, it is $\frac{3}{4}$ in. wide and _?_ in. long. $\frac{3}{4} \times 24$ ft. = 18 ft., and _?_ × 24 ft. = _?_ ft.

6. Tell how to find the real dimensions of the other rooms.



Scale: 1 in. = 24 ft.

Scale Drawing in Science

Using a scale [W]

Miss Pike's class looked in their encyclopedia for some scale drawings of well-known animals. They found this drawing of an elk to the scale $\frac{1}{60}$; that is, *1 in.* = *60 in.*

1. In the drawing, the elk's shoulder height is 1 in. What is the true shoulder height? How many feet?

2. The class found other scale drawings of the deer family to the scale $\frac{1}{72}$. Explain this scale.

3. If the scale drawing ($\frac{1}{72}$) of the white-tailed deer had a shoulder height of $\frac{1}{2}$ inch, what is the actual shoulder height?

Find actual heights and lengths if scale drawings ($\frac{1}{72}$) show these measurements (Give your answers in feet and inches.)

	Height	**Length**
4. Black-tailed deer	$\frac{1}{2}$ in.	1 in.
5. Moose	1 in.	$1\frac{7}{16}$ in.
6. Woodland caribou	$\frac{3}{4}$ in.	1 in.

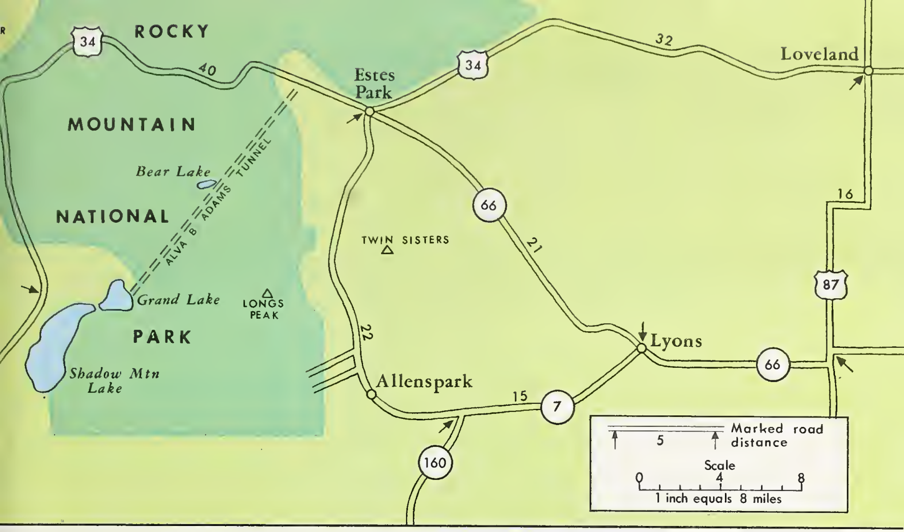
7. If the scale for the drawing of a whale is $\frac{1}{64}$ (that is, *1 in.* = *64 in.*), how long will the actual measurement be for

   a. a right whale, shown with length $7\frac{1}{2}$ in.?
   b. a sperm whale, shown with length $10\frac{1}{2}$ in.?

8. Draw a line to stand for 60 ft. Scale: $\frac{1}{8}$ *in.* = *10 ft.*

9. Draw a line to stand for 850 mi. Scale: $\frac{1}{4}$ *in.* = *50 mi.*

10. Make a scale drawing of a square which is 10 ft. on a side. Use the scale $\frac{1}{4}$ *in.* = *1 ft.* Use the corners of a piece of paper to help you make square corners.



On a Road Map

Using a scale [W]

For Ex. 1–6, use road distances when given and measure other distances, using the scale (*1 in.* = *8 mi.*).

1. In going from Loveland to Estes Park by route 34 and back over routes 66 and 87, about how far would you travel?

2. To Joe Lane, who lives 2 mi. west of Grand Lake, Long's Peak seems only 3 or 4 mi. away. How far is it?

3. Alva Adams tunnel, the world's longest irrigation tunnel, carries water from Grand Lake to a point near Estes Park. Measure to find about how many miles long the tunnel is.

4. The distance from Milner Pass to Long's Peak is about $2\frac{3}{8}$ in. on the map. About how many miles is that?

5. Which is the shorter road from Allenspark to Loveland, the road by way of Estes Park or the road by way of Lyons?

6. Many people start to climb Long's Peak from the nearest point on route 7. It is estimated that they walk 3 times as far as the straight-line distance. About how far do they walk?

What Is a Table?

Making a table from tallies [O]

Jack likes to make records of things he does and sees. One day when he was working at the brake inspection station, he kept a record by tallies (marks) of the cars which came in, according to the year in which each was made.

1946	/
1947	
1948	/
1949	
1950	//
1951	////////
1952	//////
1953	////////
1954	////////////
1955	///////////////

Jack's tallies looked like those made at the left. Jack made one mark for each car opposite the year in which the car was made.

1. Opposite which year in the list did Jack make the most marks? How many did he make?

2. Opposite which of the years was there just one mark? no mark?

1946	1
1947	0
1948	1
1949	0
1950	2
1951	?
1952	?
1953	?
1954	?
1955	?

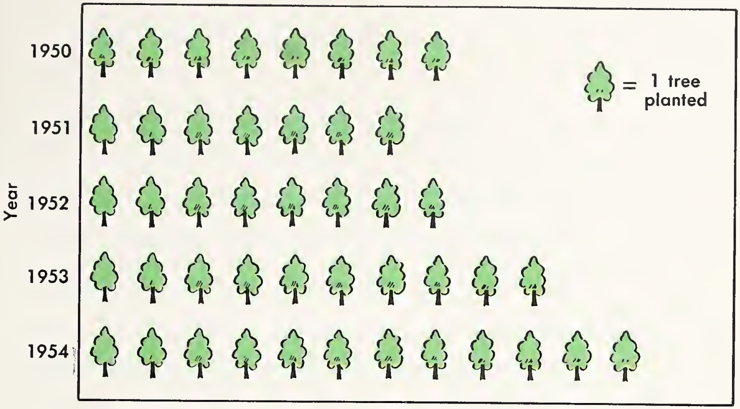
In order to make the record easier to use, Jack made the **table** shown at the right above.

3. In the table, explain the numbers beside 1946 to 1950 which stand for the tallies in the tally table.

4. What numbers should Jack write for 1951 to 1955?

Reading a Picture Graph

[O]



New Trees Planted by the Junior Conservation Club

Sometimes the information that we have recorded in a table can be shown by a picture, called a **picture graph.**

1. What is the name, or title, of this picture graph?

2. For what years does this graph give us some information?

In order to read a graph, we must look for the key which explains how to read it.

3. From the key in the upper right corner of the graph, what do you find that the picture of 1 tree means?

4. For the year 1950 the top line in the graph shows 8 trees. Then the number of new trees planted during 1950 by the Junior Conservation Club was _?_.

5. Explain about the number of new trees planted by the Conservation Club during each of the years 1951 to 1954.

[W]

6. Write down two things you could show by picture graphs. Make up the key to be used for each graph.

Making Picture Graphs

[W]

To show what is asked for in each exercise below, make a number table like the one on page 162. Then from the facts in your table, make a picture graph to go with the table.

1. The number of cents you have spent for candy each day during 1 week. Use a circle ○ to stand for 1 cent.

2. The number of glasses of milk you drank each day during one week. Use a glass to stand for 1 glass of milk.

3. The number of children absent from your room each day for a week. Let a stick man stand for 1 child.

4. The number of runs scored in each World Series game last year by the team that won the Series. (You can get this information from the *World Almanac.*) Use a baseball to stand for 1 run.

Can You Do These?

[W]

Write your work for these. Give your answers in best form.

1. $4\frac{3}{4} + 5\frac{2}{3}$ **2.** $1\frac{7}{8} + \frac{1}{6}$ **3.** $2\frac{1}{2} - 1\frac{2}{3}$ **4.** $5 - 1\frac{7}{8}$

5. $\frac{3}{4} \times 8$ **6.** $1\frac{1}{2} \times \frac{4}{5}$ **7.** $2\frac{3}{4} \times 1\frac{1}{4}$ **8.** $6\frac{1}{2} \times 24$

9. $26\overline{)1{,}438}$ **10.** $97\overline{)3{,}814}$ **11.** 160×207

12. Write in words the number 17,204,583,906.

13. Write the figures which are in these places in the number in Ex. 12: **a.** million's; **b.** ten's; **c.** thousand's; **d.** billion's; **e.** hundred million's.

14. Write a number that shows 203 thousands.

15. What number means 26 hundreds and 5 ones?

16. In the number 576,103,825, _?_ is in one's period.

So You Won't Forget!

[W]

1. Round to the nearest whole number: $7\frac{3}{8}$; $2\frac{5}{9}$; $3\frac{1}{4}$; $\frac{7}{10}$.

2. To check the sum of $2\frac{3}{4}$, $5\frac{1}{2}$, and $1\frac{1}{3}$, what round numbers will you use?

3. On a city map, a park is $\frac{5}{8}$ in. long. The scale of the map is *1 in. = 1,000 ft.* How many feet long is the park?

4. If $\frac{1}{4}$ *in. = 1 ft.*, how long a line represents 23 ft.?

5. Find the sum of 2 mi., $1\frac{7}{8}$ mi., and $2\frac{1}{2}$ mi.

6. Show by a number line that $\frac{3}{4} \times 12 = 9$.

7. One day Mr. Lane's time on three jobs was: $2\frac{1}{3}$ hr., $3\frac{3}{4}$ hr., $2\frac{1}{6}$ hr. At $2 an hour, how much did he earn?

8. Mrs. Fine says her roast should be in the oven for $3\frac{1}{4}$ hr. She put it in at 10:50 A.M. It is now 12:05 P.M. How much longer should the roast remain in the oven?

9. Cheese weighs $\frac{1}{8}$ as much as the milk used to make it. 1,296 lb. of milk will make how many pounds of cheese?

10. In a store window, a sign said: "Potatoes, 6¢ a pound." What was the price of $12\frac{1}{2}$ lb. of potatoes?

11. What is the price of $5\frac{3}{4}$ lb. of beef if 1 lb. costs 90¢?

12. In 312 ÷ 18, what is the final remainder?

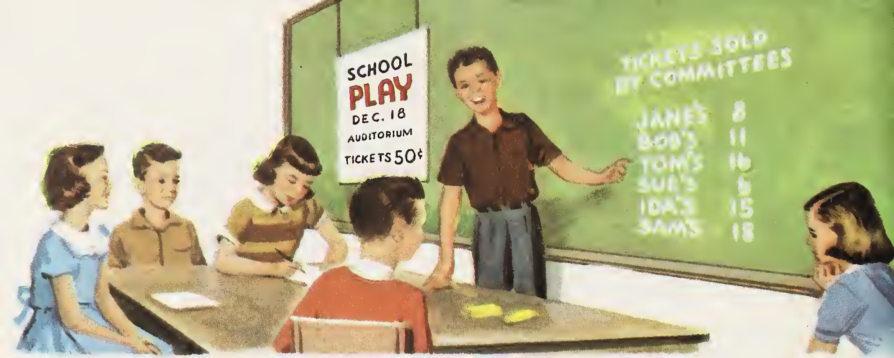
13. Round to the nearest thousand:

a. 1,429,824 **b.** 854,175 **c.** 4,059 **d.** 2,952

14. Change: **a.** 14 ft. to inches; **b.** 75 ft. to yards; **c.** 15 qt. to gallons; **d.** 25 lb. to ounces.

15. Change: **a.** $6\frac{1}{2}$ lb. to ounces; **b.** $5\frac{1}{3}$ yd. to feet; **c.** $9\frac{1}{2}$ bu. to pecks; **d.** $17\frac{3}{4}$ gal. to quarts.

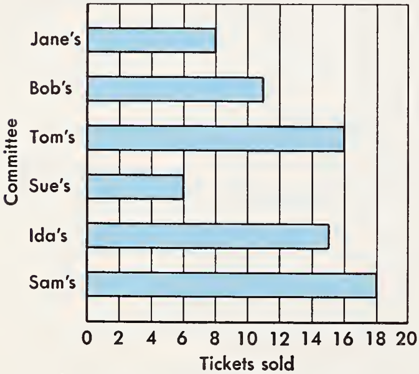
16. Write the number that has 406 in million's period, 137 in one's period, and 801 in thousand's period.



Showing Records with Bars

Horizontal-bar graph [O]

The table on the board gives the number of tickets for the play sold by committees during one week. We could show this information by a picture graph, but there is an easier way.



Ticket Sales for One Week

At the left, the numbers in the table are shown by number lines, or bars. This picture is called a **bar graph.** The key for reading this graph is that *the distance shown by each of the numbered divisions stands for 2 tickets.*

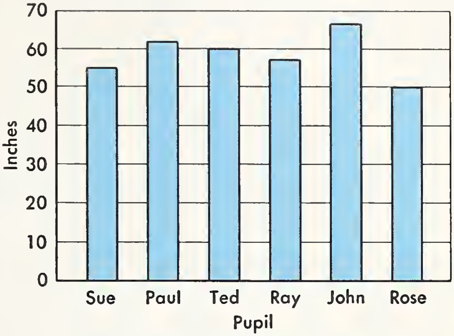
1. Compare the lengths of the bars with the numbers in the table.

2. During another week, tickets sold by other committees were: Mary's 10, Joe's 14, Cora's 13, Helen's 17, Jack's 14. On the board, make a graph for these numbers like the one above, letting *each 4-inch space equal 2 tickets.*

These bars are horizontal, that is, they go across from left to right. This kind of graph is called a **horizontal-bar graph.**

The pupils in Sue's row made a number table and a graph of their heights in inches. They made their bars vertical (straight up and down). This kind of graph is called a **vertical-bar graph.** They used this key: *The distance shown by each small space equals 10 in.*

List of Heights in Sue's Row	
Sue	55 in.
Paul	62 in.
Ted	60 in.
Ray	57 in.
John	66 in.
Rose	50 in.



Heights of Pupils in Sue's Row

3. Are the bars the right heights? Check from the table.

4. In a vertical-bar graph, which is the important thing—the width of a bar or the height? In Ex. 3, how did you check the heights of bars that did not end exactly on the scale lines? We often have to estimate in using graphs.

[W]

5. Make a vertical-bar graph for these heights in inches: Ted 62 in., Tom 68 in., Betty 58 in., Dot 60 in. Use the scale: *1 vertical space = 10 in.* Make the bars equal distances apart, so your graph will look neat.

6. Make a horizontal-bar graph to show these ages: Sam 11 yr., Jack 12 yr., Peter 10 yr., Ed 13 yr., Ray 14 yr. Use the scale: *1 horizontal space = 2 yr.*

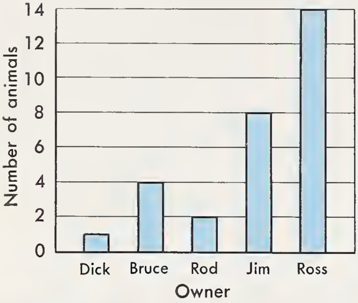
See if you can find in a newspaper or a magazine either a horizontal-bar or a vertical-bar graph which you can explain. Bring it to class.

Reading Picture and Bar Graphs

[O]

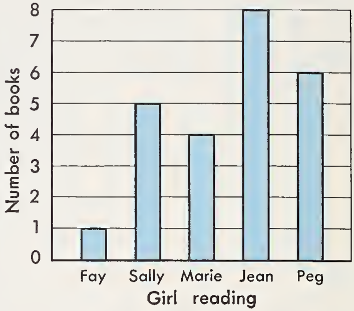
Tell the story shown by each of these graphs:

1.



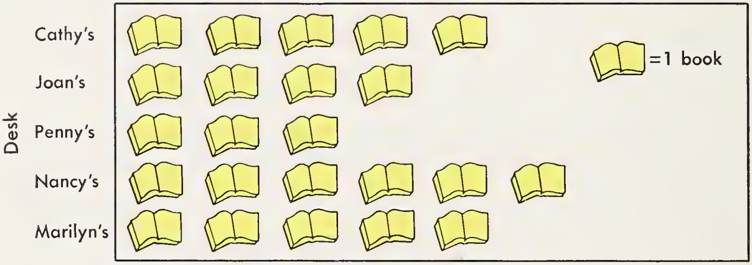
Numbers of Animals Owned by 5 Boys

2.



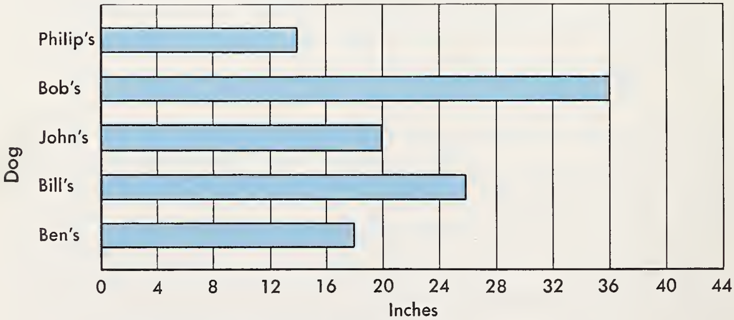
Books Read in 1 Month

3.



Books in the Desks of 5 Girls at School

4.



Lengths of Five Boys' Dogs from Nose to Tip of Tail

Work for Young Experimenters

Enrichment material [O]

Have you ever been a Young Experimenter? Young Experimenters find different ways of working with numbers.

See if you can understand how these Experimenters multiplied with fractions by using ways they thought of themselves:

Jack $4 \times 5\frac{3}{4} = ?$

$4 \times 6 = 24$; $4 \times \frac{1}{4} = 1$; $24 - 1 = 23$. So $4 \times 5\frac{3}{4} = 23$.

1. When Jack multiplied 4×6, where did he get the multiplicand, 6?

2. Why did Jack then need to multiply the fraction $\frac{1}{4}$ by 4 and subtract that product from 24?

Linda $6 \times 3\frac{1}{8} = ?$

$6 \times 3 = 18$; $6 \times \frac{1}{8} = \frac{6}{8}$, or $\frac{3}{4}$; $18 + \frac{3}{4} = 18\frac{3}{4}$. So $6 \times 3\frac{1}{8} = 18\frac{3}{4}$.

3. Was Linda multiplying parts of the multiplicand? Explain how she worked.

Sam $1\frac{7}{16} \times 14 = ?$

$1\frac{1}{2} \times 14 = 1 \times 14$, or 14, plus $\frac{1}{2} \times 14$, or 7, $= 21$

$\frac{1}{\underset{8}{16}} \times \overset{7}{14} = \frac{7}{8}$; $21 - \frac{7}{8} = 20\frac{1}{8}$. So $1\frac{7}{16} \times 14 = 20\frac{1}{8}$.

4. What did Sam do to get his first multiplier, $1\frac{1}{2}$?

5. Why did he have to multiply 14 by $\frac{1}{16}$ and subtract that product from the product of $1\frac{1}{2} \times 14$?

[W]

Try to find products for these in different ways:

6. $5 \times 8\frac{2}{3}$ 7. $\frac{7}{8} \times 92$ 8. $65 \times 3\frac{4}{5}$ 9. $192 \times 2\frac{15}{16}$

Do You Understand?

Test of Information and Meaning 4

1. In multiplying 4 by $\frac{1}{3}$ (that is, in $\frac{1}{3} \times 4$), can you get the answer by finding $\frac{1}{3}$ of 4?

2. Copy $\frac{1}{2} \times 6 = 3$ and label the product, the multiplier, and the multiplicand. Also label the factors of the product.

3. When the numerator of a fraction is larger than the denominator, what kind of fraction is it?

4. Find the answer for $4 \times \frac{7}{8}$ without multiplying.

5. What are two ways of multiplying a mixed number by a whole number? Use $24 \times 3\frac{1}{2}$ to show the two ways.

6. In which of these three multiplication examples can **n** be found by adding?

(a) $\frac{1}{3} \times \frac{1}{4} = n$ (b) $\frac{1}{3} \times 5\frac{1}{2} = n$ (c) $5 \times \frac{1}{3} = n$

7. How would you read $\frac{3}{4} \times 8$?

8. What part of 1 yd. is $\frac{1}{3}$ of 2 yd.?

9. Is $\frac{3}{5}$ equal to, greater than, or less than $\frac{1}{2}$?

10. Which of these are greater than 1: $\frac{3}{4}$? $\frac{15}{3}$? $\frac{7}{8}$? $\frac{9}{2}$?

11. $\frac{5}{8}$ is how many $\frac{1}{8}$'s? Draw a picture to show your answer.

12. How many $\frac{1}{5}$'s are there in 1? in $2\frac{2}{5}$? in $\frac{4}{5}$?

13. Round to the nearest whole number:

$1\frac{1}{2}$ $7\frac{1}{5}$ $4\frac{3}{4}$ $17\frac{2}{3}$ $25\frac{4}{5}$

14. Will the product be more or less than the multiplicand?

a. $1\frac{3}{4} \times 2$ **b.** $\frac{7}{8} \times 46$ **c.** $\frac{2}{3} \times \frac{7}{12}$

15. When the scale is $\frac{1}{4}$ *in.* = *6 ft.*, how long a line will be needed to represent 24 ft.?

16. In which direction do horizontal bars go? vertical bars?

17. What does the key on a graph do?

Practice Exercises

[W]

For Ex. 1 to 5, do what the signs tell you to do.

	a	b	c	d	e
1.	560 $\times 97$	385 $\times 240$	738 $\times 895$	$3{,}005$ $\times 408$	$5{,}800$ $\times 4{,}500$
2.	876 $+958$	609 $+392$	400 -93	846 -547	$6{,}200$ $-5{,}818$
3.	$82\overline{)416}$	$29\overline{)206}$	$16\overline{)286}$	$37\overline{)924}$	$48\overline{)1{,}208}$
4.	$5\frac{1}{2} + 2\frac{3}{4}$	$3\frac{1}{8} - 1\frac{1}{2}$	$6 - 2\frac{3}{10}$	$3\frac{4}{5} + 2\frac{7}{10}$	$3\frac{1}{3} - 2\frac{5}{6}$
5.	$\frac{3}{4} \times \frac{2}{3}$	$\frac{5}{2} \times 6$	$4 \times \frac{3}{8}$	$4\frac{5}{8} \times \frac{2}{5}$	$3\frac{1}{8} \times 5\frac{2}{3}$

6. Write with words the numbers 16,042,830 and 76,095.

7. Write in figures: one hundred seven thousand seven; four billion twenty-two million eight hundred five thousand.

Do You Make Mistakes?

Diagnostic Test 4

	Use cancellation when you can.				Study Pages	Practice Sets
	a	b	c	d		
1.	$7 \times 2\frac{3}{8}$	$12 \times \frac{5}{8}$	$6 \times \frac{3}{16}$	$4 \times 2\frac{2}{3}$	131, 132 134, 135	54, 55
2.	$1\frac{1}{4}$ $\times 5$	$3\frac{2}{5}$ $\times 4$	$6\frac{1}{4}$ $\times 8$	$4\frac{2}{3}$ $\times 7$	136	56
3.	$\frac{2}{3} \times 6$	$\frac{3}{4} \times 9$	$\frac{5}{8} \times 6$	$\frac{1}{5} \times 8$	138, 139	57, 58
4.	$4\frac{1}{5} \times 3$	$2\frac{3}{4} \times 5$	$1\frac{1}{2} \times 3\frac{5}{6}$	$2\frac{1}{2} \times \frac{4}{5}$	147, 148	63–67
5.	$\frac{3}{4} \times \frac{3}{4}$	$\frac{7}{8} \times \frac{2}{5}$	$\frac{3}{8} \times 4\frac{1}{2}$	$\frac{7}{8} \times \frac{2}{3}$	140–142 150	59–62 68–71
6.	Use drawings to solve Ex. a, b, and c. **a.** $\frac{2}{3} \times \frac{1}{2}$	**b.** $\frac{3}{4}$ of 2	**c.** $6 \times \frac{1}{4}$			

How Well Can You Figure?

Computation Test 4

1. $\begin{array}{r}400\\-192\\\hline\end{array}$	2. $\begin{array}{r}853\\-147\\\hline\end{array}$	3. $\begin{array}{r}3{,}052\\-2{,}164\\\hline\end{array}$	4. $\begin{array}{r}197\\203\\856\\980\\+76\\\hline\end{array}$	5. $\begin{array}{r}308\\476\\349\\436\\+270\\\hline\end{array}$
6. $\begin{array}{r}186\\\times 24\\\hline\end{array}$	7. $\begin{array}{r}973\\\times 300\\\hline\end{array}$	8. $\begin{array}{r}4{,}239\\\times 1{,}080\\\hline\end{array}$		

	a	b	c	d	e
9.	$64\overline{)232}$	$26\overline{)221}$	$48\overline{)2{,}432}$	$36\overline{)2{,}936}$	$18\overline{)7{,}344}$
10.	$\begin{array}{r}2\frac{1}{4}\\+6\frac{1}{2}\\\hline\end{array}$	$\begin{array}{r}4\frac{7}{8}\\+\frac{1}{2}\\\hline\end{array}$	$\begin{array}{r}5\frac{2}{3}\\+4\frac{1}{4}\\\hline\end{array}$	$\begin{array}{r}7\frac{3}{8}\\-2\frac{1}{3}\\\hline\end{array}$	$\begin{array}{r}6\frac{1}{5}\\-2\frac{4}{5}\\\hline\end{array}$
11.	$\begin{array}{r}4\frac{5}{8}\\+6\frac{3}{8}\\\hline\end{array}$	$\begin{array}{r}\frac{4}{5}\\+7\frac{3}{10}\\\hline\end{array}$	$\begin{array}{r}3\\-1\frac{2}{3}\\\hline\end{array}$	$\begin{array}{r}5\frac{1}{4}\\-2\frac{2}{3}\\\hline\end{array}$	$\begin{array}{r}8\frac{1}{2}\\-\frac{7}{10}\\\hline\end{array}$
12.	$\begin{array}{r}6\frac{3}{4}\\\times 5\\\hline\end{array}$	$\begin{array}{r}9\frac{3}{8}\\\times 6\\\hline\end{array}$	$\begin{array}{r}16\frac{5}{6}\\\times 2\\\hline\end{array}$	$\begin{array}{r}5\frac{2}{3}\\\times 7\\\hline\end{array}$	$\begin{array}{r}2\frac{1}{2}\\\times 4\\\hline\end{array}$
13.	$\begin{array}{r}25\\\times 3\frac{2}{5}\\\hline\end{array}$	$\begin{array}{r}24\\\times 2\frac{1}{3}\\\hline\end{array}$	$\begin{array}{r}28\\\times 5\frac{3}{4}\\\hline\end{array}$	$\begin{array}{r}24\\\times 2\frac{1}{2}\\\hline\end{array}$	$\begin{array}{r}400\\\times 1\frac{3}{4}\\\hline\end{array}$
14.	$5 \times 2\frac{5}{8}$	$4\frac{1}{2} \times \frac{2}{3}$	$6\frac{1}{4} \times 4$	$7 \times 2\frac{2}{3}$	$3 \times 2\frac{1}{4}$
15.	$\frac{3}{8} \times 1\frac{1}{2}$	$\frac{5}{6} \times \frac{3}{4}$	$4\frac{2}{3} \times 1\frac{3}{5}$	$\frac{1}{8} \times \frac{2}{3}$	$\frac{2}{5} \times \frac{3}{4}$

Written Practice

1. In $4 \times 1\frac{1}{2}$, which number tells the size of the equal groups? Do we call it "multiplier" or "multiplicand"?

2. In $3\frac{1}{2} \times 8$, which number counts the equal groups? Do we call it "multiplier" or "multiplicand"?

3. Find n in each of the following:

a. $24 \times n = 37$ b. $43 \times n = 1{,}118$ c. $n - 75 = 129$
d. $4\frac{1}{2} \times 16 = n$ e. $3\frac{1}{2} + n = 7\frac{3}{8}$ f. $\frac{5}{16} \times \frac{7}{10} = n$

Can You Solve Problems?

Problem Test 4

1. For re-silvering small mirrors, a shop charges 1 cent per square inch. Find the cost for a mirror $6\frac{1}{2}$ in. × $4\frac{1}{2}$ in.

2. On every paper sold, James makes $3\frac{1}{4}$¢. How much does he earn by selling 16 papers?

3. At an average speed of 50 miles an hour, how far will a car travel in $\frac{3}{4}$ hr.?

4. How much will 2 yd. of drapery material cost if the price is $3.75 per yard?

5. At $8\frac{1}{2}$¢ a pound what will be the cost of 4 lb. of dog food?

6. At 40¢ a dozen what will $2\frac{1}{2}$ doz. oranges cost?

7. John made a door from 4 boards. Each board was $6\frac{5}{8}$ in. wide. If the boards were used vertically and touching each other, how wide was the door?

8. How many square miles in a school district which is $14\frac{1}{2}$ mi. long and $8\frac{1}{2}$ mi. wide?

9. In a month Nancy's little sister grew $\frac{3}{16}$ in. At that rate how much would she grow in a year?

10. A store buys $\frac{1}{2}$ page of advertising space in a magazine and allows each of its four departments $\frac{1}{4}$ of this space. What part of a page does each department get?

11. Edna knits on her sweater $\frac{3}{4}$ hr. a day. How many hours will she knit in 30 days?

12. A certain kind of steel tubing weighs $\frac{3}{8}$ lb. to the foot. How much will $7\frac{1}{2}$ ft. weigh?

13. Three fourths of the 8,640 lb. of coal delivered to a home was hauled in the morning. This was how many pounds?

14. In a shipment of 72 cups, $\frac{1}{12}$ were broken. How many cups were broken?

5

SANITARY STRAWS
500
SANITARY STRAWS
500
SANITARY STRAWS
500
RAY QUIGLEY

Dividing a Whole Number by a Fraction

Meaning [O]

1. When the clerk opened one of the 4 boxes of straws, Jane asked, "How long will those 4 boxes of straws last?"

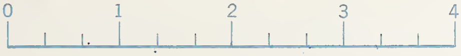
"We use about $\frac{2}{3}$ of a box a day," said the clerk. "You figure it out."

2. Jack said, "The first day you use $\frac{2}{3}$ of a box, the second day $\frac{2}{3}$ of a box, and so on. The straws will last as many days as the number of times you can take $\frac{2}{3}$ out of 4."

On a scrap of paper, Jack subtracted as at the right. How many times did he take $\frac{2}{3}$ from 4? How many $\frac{2}{3}$'s are there in 4?

3. On the back of Jack's paper, Jane made a number line, as shown below. What size are the parts shown on this line? When Jane counted the $\frac{2}{3}$'s, how many did she find in 4?

Jane's Way



Jack's Way

$$\begin{array}{rl} 4 & \\ -\frac{2}{3} & (1) \\ \hline 3\frac{1}{3} & \\ -\frac{2}{3} & (2) \\ \hline 2\frac{2}{3} & \\ -\frac{2}{3} & (3) \\ \hline 2 & \\ -\frac{2}{3} & (4) \\ \hline 1\frac{1}{3} & \\ -\frac{2}{3} & (5) \\ \hline \frac{2}{3} & \\ -\frac{2}{3} & (6) \\ \hline 0 & \end{array}$$

4. Did Jack and Jane get the same answers?

5. How long would 8 boxes last? On the board, find the answer in two ways—by subtracting and by making a number line.

[W]

6. By subtracting, find how many

a. $\frac{1}{2}$'s in 4; **b.** $\frac{3}{5}$'s in 9; **c.** $\frac{3}{4}$'s in 6; **d.** $\frac{4}{5}$'s in 8.

7. By using number lines, find how many

a. $\frac{1}{5}$'s in 3; **b.** $\frac{5}{8}$'s in 5; **c.** $\frac{2}{5}$'s in 8; **d.** $\frac{3}{8}$'s in 6.

8. For one of the special chocolate marshmallow sundaes, the clerk uses about $\frac{1}{6}$ quart of ice cream. How many of these sundaes can he make from a gallon of ice cream? (Find the answer by subtracting.)

Dividing a Whole Number by a Fraction

Meaning; common-denominator method [O]

1. When Jack and Jane were finding the number of $\frac{2}{3}$ boxes in 4 boxes of straws, a quicker way to work would have been to divide by the fraction. We write the division example this way: "$4 \div \frac{2}{3} = ?$" This means "How many $\frac{2}{3}$'s are there in 4?"

In finding the number of $\frac{2}{3}$'s in 4, the work is easy if we change 4 to $\frac{1}{3}$'s. Why does 4 equal $\frac{12}{3}$?

If $\frac{12}{3}$ is written "12 thirds" and $\frac{2}{3}$ is written "2 thirds," we can write, "$4 \div \frac{2}{3} =$ 12 thirds ÷ 2 thirds." Why do we know that 12 thirds ÷ 2 thirds = 6?

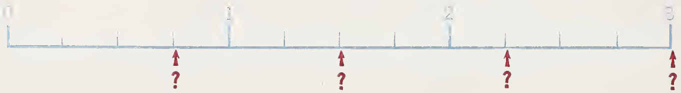
Now explain why $\frac{12}{3} \div \frac{2}{3} = 6$.

Changing both numbers before we divide so that they will have a common fractional unit, is called dividing by using a **common denominator.**

2. On the board find how many times the fraction $\frac{3}{4}$ is contained in the whole number 3

by subtracting $\frac{3}{4}$ from 3 as many times as you can; then

by using a number line like the one below; and then



by dividing with the use of a common denominator.

$3 = \frac{12}{4}$. $\frac{12}{4} \div \frac{3}{4} = 12 \div 3$, or _?_

3. Find on the board how many times the fraction $\frac{2}{3}$ is contained in the whole number 6

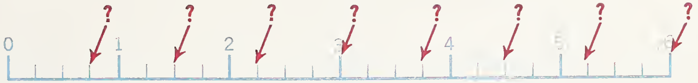
by subtracting $\frac{2}{3}$ from 6 as many times as you can; then

by using a number line; and then

by using a common denominator in a division example.

4. Peg wanted to make ribbon streamers $\frac{3}{4}$ yd. long for her bicycle handlebars. She had 6 yd. of ribbon. How many streamers $\frac{3}{4}$ yd. long could Peg get from 6 yd.?

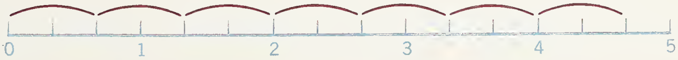
To find out, Peg made a number line like the one below. The line shows _?_ yards, each divided into _?_. Explain. Count to find how many streamers Peg could get.



Using the common-denominator method, divide 6 by $\frac{3}{4}$ on the board. Which do you think is easier, dividing this way or drawing a number line and counting $\frac{3}{4}$'s?

5. When we divide a whole number by a fraction, we do not always get a whole number for an answer. $5 \div \frac{2}{3} = ?$

Look at the number line below. It shows _?_ thirds in all. The 15 thirds are divided into groups of 2. There are _?_ whole groups and 1 extra third. Since each group has 2 thirds, the 1 extra third is half of another group. Then the quotient for $5 \div \frac{2}{3}$ is $7\frac{1}{2}$.



To find the quotient by the common-denominator method, we work this way: $5 \div \frac{2}{3} = \frac{15}{3} \div \frac{2}{3}$, or $15 \div 2$, or _?_

6. Tell in your own words how to divide a whole number by a fraction when you use a common denominator.

Using a Common Denominator in Dividing

Whole number ÷ *fraction* [O]

1. In order to use the common-denominator method in finding the quotient for $8 \div \frac{1}{2}$, the whole-number dividend 8 must be changed to a fraction with the same fractional unit as the fraction divisor has.

To change 8 to halves, *think*, "In 1 whole there are 2 halves, or $\frac{2}{2}$, so in 8 wholes there are $8 \times \frac{2}{2}$, or $\frac{?}{2}$."

2. Explain what was done in Ex. a–c to get the fraction equivalents. For Ex. d–o, give the missing numerators.

a. $6 = \frac{18}{3}$
b. $5 = \frac{50}{10}$
c. $4 = \frac{32}{8}$
d. $12 = \frac{?}{4}$
e. $8 = \frac{?}{4}$
f. $5 = \frac{?}{8}$
g. $9 = \frac{?}{6}$
h. $12 = \frac{?}{3}$
i. $10 = \frac{?}{5}$
j. $14 = \frac{?}{4}$
k. $16 = \frac{?}{5}$
l. $15 = \frac{?}{3}$
m. $21 = \frac{?}{8}$
n. $18 = \frac{?}{3}$
o. $24 = \frac{?}{5}$

Explain how to change the whole number in each example so that you could divide by the common-denominator method.

	a	b	c	d	e
3.	$7 \div \frac{2}{3}$	$8 \div \frac{3}{4}$	$5 \div \frac{7}{8}$	$9 \div \frac{5}{6}$	$14 \div \frac{3}{4}$
4.	$4 \div \frac{3}{8}$	$24 \div \frac{3}{5}$	$18 \div \frac{2}{3}$	$21 \div \frac{5}{8}$	$16 \div \frac{4}{5}$

[W]

Using common denominators, divide in rows 5–8.

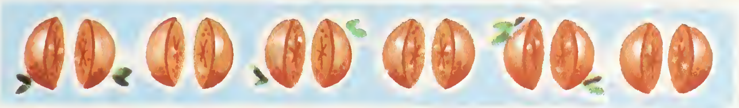
5.	$16 \div \frac{4}{5}$	$18 \div \frac{5}{7}$	$21 \div \frac{3}{4}$	$45 \div \frac{5}{8}$	$72 \div \frac{8}{9}$
6.	$12 \div \frac{3}{8}$	$24 \div \frac{8}{9}$	$25 \div \frac{7}{8}$	$54 \div \frac{9}{11}$	$64 \div \frac{3}{8}$
7.	$15 \div \frac{2}{9}$	$28 \div \frac{4}{5}$	$36 \div \frac{9}{10}$	$28 \div \frac{7}{8}$	$63 \div \frac{9}{10}$
8.	$14 \div \frac{2}{5}$	$32 \div \frac{4}{7}$	$42 \div \frac{6}{7}$	$12 \div \frac{5}{6}$	$49 \div \frac{7}{12}$

▶ **Extra Practice.** For more practice work Sets 72 and 73.

To divide a whole number by a fraction, you can first change the whole number so that the dividend and the divisor will have a common denominator. Then divide the numerator of the dividend by the numerator of the divisor.

Dividing by a Mixed Number

Dividend a whole number [O]



1. If $1\frac{1}{2}$ oranges make a small glass of orange juice, how many glasses of juice will you get from 6 oranges?

What is the fractional unit for the oranges in the picture?

Explain how to find the quotient from the picture.

We can do the changing with figures to make the dividend and the divisor have the same fractional unit.

$6 = \frac{?}{2}$ $1\frac{1}{2} = \frac{?}{2}$ $\frac{12}{2} \div \frac{3}{2} = 12 \div 3$, or _?_.

Why is it easy to divide a whole number by a mixed number after you have learned to divide a whole number by a fraction?

To divide a whole number by a mixed number, you can change the whole number and the mixed number to fractions with a common denominator. Then divide, using only the numerators.

[W]

Work the examples below by using common denominators.

	a	**b**	**c**	**d**	**e**
2.	$5 \div 2\frac{1}{2}$	$9 \div 1\frac{1}{3}$	$3 \div 1\frac{1}{2}$	$8 \div 4\frac{1}{2}$	$4 \div 1\frac{1}{3}$
3.	$10 \div 1\frac{1}{4}$	$15 \div 7\frac{1}{2}$	$5 \div 3\frac{1}{8}$	$6 \div 1\frac{1}{3}$	$8 \div 1\frac{1}{3}$
4.	$10 \div 8\frac{1}{3}$	$12 \div 5\frac{1}{2}$	$4 \div 2\frac{1}{3}$	$3 \div 2\frac{1}{2}$	$2 \div 1\frac{2}{3}$
5.	$8 \div 6\frac{2}{3}$	$8 \div 5\frac{1}{7}$	$7 \div 2\frac{2}{5}$	$2 \div 1\frac{1}{3}$	$12 \div 2\frac{2}{3}$
6.	$15 \div 4\frac{1}{2}$	$9 \div 1\frac{3}{5}$	$12 \div 1\frac{4}{5}$	$8 \div 3\frac{1}{3}$	$12 \div 1\frac{2}{3}$

Check your quotients for row 2 by multiplying quotient and divisor.

➤ **Extra Practice.** For more practice, work Sets 74 and 75.

Alan and Betsy on Grandfather's Farm

[W]

Use the common-denominator method in working these problems. Write all your work. If you need help with any problem, draw a diagram.

1. Grandfather asked Alan to make a fence along the front walk by setting up wire wickets. The walk was just 21 ft. long, and each of the wickets filled a space of $1\frac{1}{2}$ ft. How many wickets did Alan use in all?

2. Grandfather said that his power lawn mower would operate $2\frac{1}{2}$ hours on a gallon of gasoline. How many gallons of gasoline would it use in 24 hours of operation?

3. Alan found a piece of wire 9 feet long. How many $1\frac{1}{2}$-foot pieces can he cut from it?

4. Betsy picked 21 quarts of cherries in $3\frac{3}{4}$ hours. That was an average of how many quarts per hour?

5. How many roofing boards, just the right length and $\frac{1}{2}$ foot wide, should Grandfather order for a roof on a small lean-to shed which is 16 ft. wide?

6. Alan carried water in a pail holding $2\frac{1}{2}$ gallons. To fill a 40-gallon tub, how many pailfuls did he carry?

7. At the store Betsy paid 5¢ for a candy bar that weighed $1\frac{1}{3}$ ounces. How much did the candy cost per ounce?

Just to Remind You!

[O]

Estimate answers for Ex. 1–7.

	a	b	c	d	e	f
1.	1,460 +1,812	3,608 +7,395	8,916 −703	1,036 −359	7,412 −3,385	4,061 −2,384
2.	306 ×18	476 ×38	196 ×205	429 ×300	876 ×893	600 ×210
3.	$2\frac{1}{4}$ $+3\frac{1}{2}$	$6\frac{1}{8}$ $+1\frac{2}{3}$	$7\frac{1}{2}$ $+\frac{3}{4}$	$5\frac{3}{4}$ $-\frac{1}{4}$	8 $-1\frac{2}{5}$	$4\frac{1}{2}$ $-2\frac{2}{3}$

4. $7\overline{)1,703}$ **5.** $8\overline{)6,000}$ **6.** $41\overline{)1,264}$ **7.** $72\overline{)5,814}$

8. How many square miles are there in a ranch that is 8 miles long and 4 miles wide?

9. In 12,638,507, what figure is in ten-million's place?

10. Which is larger, $\frac{5}{10}$ or $\frac{5}{11}$? $\frac{4}{5}$ or $\frac{3}{8} \times 2$?

11. What is a common denominator for thirds and fifths?

12. Which product will be larger?

(a) 3×567 or 12×567 (b) $\frac{1}{4} \times 768$ or $\frac{1}{8} \times 768$

13. If $6 \times 17 = 102$, how can you find what 12×17 is without multiplying by 12?

14. From $14 \times 72 = 1,008$, tell how to find quickly 7×72.

15. In $73\overline{)4,073}$ what is the first partial dividend?

16. If $\frac{3}{4} \times 3\frac{1}{3} = 2\frac{1}{2}$, what does **n** equal in $3\frac{1}{3} \times \frac{3}{4} = n$?

17. Will the product be more or less than the multiplicand?

a. $\frac{1}{7} \times 4,284$ **b.** $5\frac{1}{2} \times 492$ **c.** $\frac{7}{3} \times 84$

18. Which fractions can be reduced to better form?

$\frac{7}{8}$ $\frac{3}{6}$ $\frac{12}{14}$ $\frac{8}{12}$ $\frac{4}{16}$ $\frac{5}{9}$ $\frac{5}{25}$ $\frac{10}{15}$ $\frac{6}{9}$

[W]

Copy the examples in Ex. 1–7 and find the exact answers.

Bob and Jim Go Fishing

Comparing by using a fraction; ratio **[O]**

1. Jim has a string of 7 fish. Bob's string has only 2 fish. How do you compare Jim's fish with Bob's fish?

You can subtract. Then you can say that Jim caught 5 more fish than Bob; or that Bob caught 5 fewer fish than Jim.

But you can compare also by using an improper fraction and a proper fraction.

As an improper fraction

$$\frac{\text{Jim's } 7}{\text{Bob's } 2} = \frac{7}{2}$$

As a proper fraction

$$\frac{\text{Bob's } 2}{\text{Jim's } 7} = \frac{2}{7}$$

When we use a fraction to compare two groups or numbers, we show relationship (ratio). For the fish, we say:

The ratio of Jim's 7 fish to Bob's 2 fish is $\frac{7}{2}$ (seven to two).
The ratio of Bob's 2 fish to Jim's 7 fish is $\frac{2}{7}$ (two to seven).

Tell the two ratios you would use in comparing the two groups in each of the following:

2. Bob's pole is 8 ft. long. Jim's is 12 ft. long.

3. Jim lives 2 mi. from the lake. Bob lives 1 mi. from it.

4. Bob brought 4 sandwiches. Jim brought 3 sandwiches.

5. Bob had 23 worms to use for bait. Jim had 17 worms.

We often use a fraction to show the relation between two groups or numbers. This relation is called a ratio.

Many times the fraction which expresses a ratio is not in best form and should be reduced.

Look back at Ex. 2 on page 182. Tell again the two ratios you would use. To state the ratios in best form, we should reduce both fractions as in these boxes:

As a proper fraction:

$\frac{\text{Bob's, 8 ft.}}{\text{Jim's, 12 ft.}} = \frac{8}{12}$, or $\frac{2}{3}$

As an improper fraction:

$\frac{\text{Jim's, 12 ft.}}{\text{Bob's, 8 ft.}} = \frac{12}{8}$, or $\frac{3}{2}$, or $1\frac{1}{2}$

With the fractions reduced, it is easier to understand what the ratios mean when we compare this way:

Bob's pole is $\frac{2}{3}$ as long as Jim's pole.
Jim's pole is $1\frac{1}{2}$ times as long as Bob's pole.

[W]

Write in best form the two ratios by which you can compare the numbers in each of the following exercises. Then, as is done for the ratios above, write out the comparisons in sentence form.

6. A lake is 8 mi. wide and 10 mi. long.

7. Jack walked 5 mi. Sam walked 10 mi.

8. Claire's story was 5 pages long. Hope's was 2 pages.

9. Line *a* is 2 in. long. Line *b* is 6 in. long.

10. Plain ice cream cost 15¢. A sundae cost 25¢.

11. A factory makes 3 trucks for every 7 cars.

HELPER. This is one way of saying that the ratio of the number of trucks made by this factory to the number of cars is $\frac{3}{7}$. Then the ratio of the number of cars to the number of trucks is $\frac{?}{?}$. The factory makes _?_ as many trucks as cars, and _?_ times as many cars as trucks.

Comparison by Division

With whole numbers [O]

1. When Bill compared his 24¢ with Joe's 6¢, he wrote "$\frac{24}{6} = 4$." The quotient means that 24 is 4 times as large as _?_. So when we divide to compare a larger number with a smaller (24 ÷ 6), the quotient is a **how-many-times number,** that is, a number larger than 1. $\frac{24}{6}$ means 24 ÷ 6, or 4.

2. Joe compared his money with Bill's by writing "$\frac{6}{24} = \frac{1}{4}$." The $\frac{1}{4}$ means that 6 is $\frac{1}{4}$ of _?_. When we divide to compare a smaller number with a larger number (6 ÷ 24), the quotient is a **what-part-of number,** that is, a number smaller than 1.

3. For 8 ÷ 8 = 1, why is the 1 a how-many-times number?

Without dividing, tell for each example whether the quotient will be a how-many-times number or a what-part-of number.

	a	b	c	d	e
4.	36 ÷ 4	5 ÷ 25	35 ÷ 7	8 ÷ 24	6 ÷ 18
5.	4 ÷ 16	42 ÷ 6	9 ÷ 36	7 ÷ 21	15 ÷ 5
6.	8 ÷ 32	40 ÷ 5	6 ÷ 24	9 ÷ 45	3 ÷ 27
7.	25 ÷ 4	31 ÷ 7	4 ÷ 12	29 ÷ 7	44 ÷ 6

When you compare two numbers by division, the quotient answers one of two questions:

(1) The dividend is how many times the divisor?
(2) The dividend is what part of the divisor?

The statement at the bottom of page 184 is always true, no matter whether you are comparing whole numbers, fractions, or mixed numbers. Although you do not yet know how to do all kinds of division with fractions, you can tell by looking at any example whether the quotient will be a how-many-times number or a what-part-of number. All you have to do is to look at the dividend and the divisor and decide which is larger.

8. Dick walks $\frac{1}{3}$ mi. to school, and Ray walks $\frac{4}{5}$ mi. To compare Dick's distance with Ray's, we can write the ratio $\frac{\frac{1}{3}}{\frac{4}{5}}$ or $\frac{1}{3} \div \frac{4}{5}$. Which is larger, $\frac{1}{3}$ or $\frac{4}{5}$? Will the quotient be a how-many-times number or a what-part-of number?

When we compare Ray's distance with Dick's, we can write $\frac{4}{5} \div \frac{1}{3}$. Then which kind of number will the quotient be?

9. In the following examples, tell which quotients are how-many-times numbers and which are what-part-of numbers:

a. $\frac{1}{8} \div \frac{3}{5} = \frac{5}{24}$; **b.** $\frac{3}{4} \div \frac{7}{9} = \frac{27}{28}$; **c.** $2 \div \frac{1}{2} = 4$; **d.** $\frac{5}{8} \div \frac{2}{7} = 2\frac{3}{16}$.

For each example below, tell which is larger, the dividend or the divisor. Then, without dividing, tell whether the quotient will be a what-part-of number or a how-many-times number.

	a	b	c	d	e
10.	$6 \div \frac{3}{4}$	$\frac{1}{3} \div \frac{1}{8}$	$2\frac{1}{2} \div \frac{3}{4}$	$2 \div 5\frac{1}{2}$	$\frac{5}{6} \div 4$
11.	$1\frac{1}{2} \div 4$	$\frac{7}{8} \div 5$	$\frac{2}{3} \div 1\frac{1}{2}$	$2\frac{1}{2} \div 8\frac{2}{3}$	$2 \div 1\frac{1}{2}$
12.	$2\frac{3}{4} \div 3\frac{1}{2}$	$6 \div 3\frac{1}{4}$	$7\frac{1}{2} \div 3$	$3\frac{3}{4} \div 5$	$\frac{2}{3} \div \frac{1}{4}$

When we compare two numbers by division:

If the dividend is larger than the divisor, the quotient is a how-many-times number (that is, a number larger than 1).

If the dividend is smaller than the divisor, the quotient is a what-part-of number (that is, a number smaller than 1).

A Busy Office

Fraction ÷ whole number; inversion [O]

1. Carl, the office boy, used $\frac{3}{4}$ pint of ink in filling 6 inkwells of the same size. What part of a pint did each inkwell hold?

Must we divide $\frac{3}{4}$ pt. into 6 equal parts? To find the answer, we can *think*, "$\frac{1}{6}$ of $\frac{3}{4} = ?$" Then we can work as in box A. Explain the work. Each inkwell held _?_ pt.

A

$$\frac{3}{4} \div 6 = \frac{1}{6} \text{ of } \frac{3}{4} = \frac{1}{6} \times \frac{3}{4} = \frac{3}{24}, \text{ or } \frac{1}{?}$$

2. Now look again at the third step in box A. Could we write $\frac{3}{4} \times \frac{1}{6}$ instead of $\frac{1}{6} \times \frac{3}{4}$? Explain. Then we could write

$$\frac{3}{4} \div 6 = \frac{3}{4} \div \frac{6}{1} = \frac{3}{4} \times \frac{1}{6}.$$

When we make the change from $\frac{3}{4} \div \frac{6}{1}$ to $\frac{3}{4} \times \frac{1}{6}$, what happens to the divisor, $\frac{6}{1}$? When we change the divisor from $\frac{6}{1}$ to $\frac{1}{6}$, we say that we **invert** the divisor. Any fraction can be inverted.

The short way to find the quotient for $\frac{3}{4} \div 6$ is to write

$$\frac{3}{4} \div 6 = \frac{3}{4} \times \frac{1}{6} = \frac{3}{24}, \text{ or } \frac{1}{8}.$$

Could you use cancellation to make the work even shorter? Explain.

Tell what multiplication example you would write for each of Ex. 3–7 after inverting the divisor.

3. $\frac{2}{3} \div 8$ 4. $\frac{7}{8} \div 3$ 5. $\frac{4}{5} \div 8$ 6. $\frac{5}{8} \div 10$ 7. $\frac{3}{4} \div 6$

The method of inverting the divisor and multiplying (the *inversion method*) is such a good short cut that we use it in all kinds of examples in division with fractions. Study Ex. 8 to see how we use it when we divide to compare two numbers.

8. Miss Read spends about 5 hours a day typing. After typing for $\frac{5}{6}$ hr., she has spent what part of her 5 hr.?

Will the quotient be a what-part-of number or a how-many-times number? Explain. We *think*, "$\frac{5}{6}$ hr. is what part of 5 hr., or $\frac{5}{6} \div 5 = ?$"

Explain the work in box B. $\frac{5}{6}$ hr. is what part of 5 hr.?

How is the division checked in box B? Is this the same kind of check that we use for division with whole numbers?

B

$$\frac{5}{6} \div 5 = \frac{5}{6} \div \frac{5}{1} = \frac{\overset{1}{\cancel{5}}}{6} \times \frac{1}{\underset{1}{\cancel{5}}} = \frac{1}{6}$$

Check

$$\frac{1}{6} \times 5 = \frac{5}{6}$$

To divide a fraction by a whole number, you can invert the divisor and then multiply.

[W]

Work problems 9 and 10 as in box B above.

9. Miss Read left a margin of $\frac{7}{8}$ in. at the bottom of a 14-inch page. The margin was what part of the total length?

10. It is 2 mi. from Carl's house to the office. If he walks $\frac{4}{5}$ mi., what part of the 2 mi. has he walked?

Divide by the inversion method. Check as in box B.

	a	b	c	d	e
11.	$\frac{9}{10} \div 3$	$\frac{4}{7} \div 3$	$\frac{3}{5} \div 4$	$\frac{2}{5} \div 6$	$\frac{2}{3} \div 2$
12.	$\frac{2}{7} \div 4$	$\frac{5}{6} \div 2$	$\frac{3}{10} \div 6$	$\frac{3}{4} \div 3$	$\frac{1}{3} \div 2$
13.	$\frac{1}{3} \div 4$	$\frac{9}{16} \div 3$	$\frac{7}{8} \div 5$	$\frac{4}{5} \div 4$	$\frac{5}{16} \div 3$

➤ **Extra Practice.** For more practice, work Sets 76 and 77.

Dividing a Mixed Number

Mixed number ÷ whole number [O]

1. The first week of vacation, Sam worked in the garden $4\frac{1}{2}$ hr., and Ted worked 3 hr. The next week Sam worked $4\frac{1}{2}$ hr. again, but Ted worked 9 hr. Find the ratio of Sam's hours to Ted's for each week; that is, compare Sam's hours with Ted's.

Explain the way the two ratios are written in box A. Why will the first quotient be a how-many-times number and the second, a what-part-of number?

A

1st week: $\frac{4\frac{1}{2}}{3} = 4\frac{1}{2} \div 3 = ?$

2d week: $\frac{4\frac{1}{2}}{9} = 4\frac{1}{2} \div 9 = ?$

Before dividing in boxes B and C, what must you do to the mixed number $4\frac{1}{2}$? Then do you work just as you do when the dividend is a fraction? Explain the work in the boxes.

B

1st week: How many times?

$4\frac{1}{2} \div 3 = ? \qquad (4\frac{1}{2} = \frac{9}{2})$

$$\frac{9}{2} \div 3 = \frac{\overset{3}{\cancel{9}}}{2} \times \frac{1}{\underset{1}{\cancel{3}}} = \frac{3}{2} = 1\frac{1}{2}$$

Sam worked $1\frac{1}{2}$ times as long as Ted.

C

2d week: What part of?

$4\frac{1}{2} \div 9 = ? \qquad (4\frac{1}{2} = \frac{9}{2})$

$$\frac{9}{2} \div 9 = \frac{\overset{1}{\cancel{9}}}{2} \times \frac{1}{\underset{1}{\cancel{9}}} = \frac{1}{2}$$

Sam worked $\frac{1}{2}$ as long as Ted.

Read Ex. 2–13 to show the meaning of each comparison. For Ex. 2, say, "$6\frac{1}{2}$ is how many times 2?" For Ex. 3, say "$1\frac{7}{8}$ is what part of 5?"

2. $6\frac{1}{2} \div 2$
3. $1\frac{7}{8} \div 5$
4. $3\frac{1}{4} \div 8$
5. $2\frac{5}{8} \div 6$
6. $9\frac{1}{3} \div 4$
7. $5\frac{3}{4} \div 5$
8. $5\frac{4}{7} \div 13$
9. $3\frac{1}{10} \div 10$
10. $2\frac{2}{5} \div 6$
11. $4\frac{5}{16} \div 2$
12. $8\frac{1}{8} \div 15$
13. $2\frac{2}{3} \div 5$

[W]

Now go back and work Ex. 2–13. Use the inversion method. To check your work in Ex. 2–5, divide again by the common-denominator method.

Extra Practice. For more practice, work Sets 78–80.

Problems in Dividing a Mixed Number

Divisor a whole number [W]

Write out your work for these problems:

1. Mary helped her mother label some glasses of jelly. Mary cut 5 labels of equal length from a strip of gummed paper $4\frac{3}{8}$ inches long. How long was each label?

2. Grandfather said that when he was a boy he used to buy licorice candy in strings $8\frac{1}{2}$ inches long and divide them with his brother. How long would half a string be?

3. Mrs. Jeans wanted to serve 5 glasses of iced coffee. She had $1\frac{1}{4}$ cups of cream. If she divided the cream equally, how much cream did she put in each glass?

4. At a candy pull, Joan and Ruth pulled a piece of molasses taffy until it made a rope $8\frac{3}{4}$ inches long. They cut the rope into 10 equal pieces. How long was each piece?

5. In writing a report Miss Evans wants to make 5 columns of equal width in a space $6\frac{1}{2}$ inches wide. How wide can she make each column?

Problems in Division

[O]

Tell for each problem the division example to use.

1. What part of 5 qt. is $\frac{3}{4}$ of a quart?

2. At 90¢ a yard, what part of a yard of cloth can be bought for 60¢?

3. It is 12 mi. to town and Mr. Hill has driven 8 mi. toward town. What part of the trip has he covered?

4. What part of a pound (16 oz.) is 6 oz.?

5. Mrs. Bundy has 10 in. more to knit on her afghan. If she knits $\frac{5}{8}$ in. an hour, how many hours will it take to finish it?

6. Sam cut 15 pieces of equal length from 12 ft. of lumber. Find the length of each piece.

[W]

Now go back and solve problems 1–6.

Practice with Whole Numbers

[W]

Copy and work. Use R with any remainder in division.

1. $\begin{array}{r}8{,}764\\219\\4{,}613\\+723\\\hline\end{array}$
2. $\begin{array}{r}\$869.61\\42.78\\73.18\\+97.06\\\hline\end{array}$
3. $\begin{array}{r}6{,}763\\4{,}972\\6{,}943\\+307\\\hline\end{array}$
4. $\begin{array}{r}4{,}352\\6{,}427\\961\\+814\\\hline\end{array}$
5. $\begin{array}{r}\$9.82\\7.68\\0.09\\+0.56\\\hline\end{array}$

6. $\begin{array}{r}817\\-469\\\hline\end{array}$
7. $\begin{array}{r}5284\\\times 69\\\hline\end{array}$
8. $\begin{array}{r}3{,}060\\-891\\\hline\end{array}$
9. $\begin{array}{r}6{,}059\\\times 76\\\hline\end{array}$
10. $\begin{array}{r}\$72.00\\-48.75\\\hline\end{array}$

11. $\begin{array}{r}716\\\times 87\\\hline\end{array}$
12. $\begin{array}{r}8{,}738\\-4{,}965\\\hline\end{array}$
13. $\begin{array}{r}\$5.49\\\times 54\\\hline\end{array}$
14. $\begin{array}{r}6{,}007\\-428\\\hline\end{array}$
15. $\begin{array}{r}2{,}786\\\times 49\\\hline\end{array}$

16. $78\overline{)2{,}190}$
17. $84\overline{)9{,}864}$
18. $69\overline{)5{,}082}$
19. $25\overline{)\$50.00}$

20. $64\overline{)5{,}136}$
21. $56\overline{)2{,}252}$
22. $46\overline{)3{,}496}$
23. $45\overline{)\$31.50}$

So You Won't Forget!

[W]

1. $3 \div \frac{3}{4} = ?$ Find the quotient by subtracting.

2. By using a number line divide 6 by $\frac{3}{4}$.

3. Divide $\frac{1}{4}$ by 3 by the inversion method.

4. Divide 7 by $\frac{2}{3}$ by the common-denominator method.

5. Decide without dividing: Is the quotient more or less than 1 in

a. $5 \div \frac{5}{8}$? **b.** $9 \div 10$? **c.** $20 \div 18$? **d.** $1 \div \frac{7}{8}$?

6. Find what part **a.** 2 is of 6; **b.** $\frac{4}{5}$ is of 2.

7. We check $8 \div 5 = 1\frac{3}{5}$ by writing "$1\frac{3}{5} \times 5 = 8$." Then for $9 \div 2 = 4\frac{1}{2}$, we write "_?_ $\times 2 = 9$."

8. $12 \div \frac{3}{4} = 16$, so $16 \times$ _?_ $= 12$.

9. $\frac{1}{2} \div 6 = \frac{1}{12}$, so _?_ $\times$ _?_ $= \frac{1}{2}$.

Work all the examples in rows 10–13 by inverting the divisor and then multiplying. Check to see if each quotient is reasonable by thinking, "Should the quotient be more than or less than 1?"

	a	b	c	d	e
10.	$5 \div 27$	$\frac{5}{6} \div 9$	$10 \div \frac{2}{9}$	$1 \div \frac{2}{7}$	$7 \div 14$
11.	$1 \div \frac{2}{3}$	$\frac{6}{7} \div 2$	$5 \div \frac{2}{5}$	$130 \div 7$	$\frac{3}{5} \div 15$
12.	$10 \div \frac{1}{6}$	$1 \div 8$	$2 \div \frac{1}{3}$	$21 \div \frac{3}{4}$	$18 \div \frac{2}{3}$
13.	$\frac{4}{9} \div 2$	$3 \div \frac{2}{3}$	$8 \div \frac{1}{8}$	$\frac{7}{8} \div 7$	$2 \div 10$

When the Dividend Is 1

[W]

1. Study the exercises below. Then try to write an easy way for getting the quotient when the dividend is 1.

a. $1 \div \frac{2}{3} = \frac{3}{2}$ **b.** $1 \div \frac{5}{4} = \frac{4}{5}$ **c.** $1 \div \frac{1}{5} = \frac{5}{1}$ **d.** $1 \div \frac{5}{1} = \frac{1}{5}$

2. Write just the quotients:

a. $1 \div \frac{4}{7} = ?$ **b.** $1 \div 8 = ?$ **c.** $1 \div \frac{3}{4} = ?$

A Page of Practice

[O]

Give the sums without using pencil and paper.

	a	b	c	d	e	f
1.	22 +7	54 +3	26 +4	45 +7	63 +9	38 +6
2.	19 +8	47 +6	28 +5	36 +8	17 +7	98 +9

[W]

Copy and work. Use R with any remainder in division.

3. $\begin{array}{r} 6{,}876 \\ 71{,}945 \\ 2{,}639 \\ 3{,}663 \\ 9{,}875 \\ +376 \\ \hline \end{array}$

4. $76 \times 8{,}765$

5. $3{,}768 - 1{,}985$

6. $29{,}470 \div 76$

7. $5{,}200 - 647$

8. $\begin{array}{r} 5{,}207 \\ -4{,}958 \\ \hline \end{array}$

9. $\begin{array}{r} 486 \\ \times 208 \\ \hline \end{array}$

10. $\begin{array}{r} 3{,}506 \\ +309 \\ \hline \end{array}$

11. $56\overline{)1{,}758}$

12. $15\overline{)7{,}805}$

13. $162\overline{)984}$

	a	b	c	d	e
14.	$\frac{5}{6} + \frac{3}{8}$	$\frac{3}{10} + \frac{3}{4}$	$\frac{1}{5} - \frac{1}{6}$	$\frac{7}{8} - \frac{5}{6}$	$4\frac{3}{8} + \frac{2}{3}$
15.	$\frac{4}{9} + \frac{5}{6}$	$\frac{5}{8} - \frac{1}{12}$	$\frac{1}{4} + \frac{1}{6}$	$\frac{7}{10} - \frac{4}{15}$	$2 - \frac{7}{8}$
16.	$12\frac{7}{8} - 4\frac{3}{8}$	$5 - 1\frac{2}{3}$	$12\frac{1}{6} - 9\frac{5}{6}$	$8 - 4\frac{2}{3}$	$6\frac{7}{10} - \frac{9}{10}$
17.	$\begin{array}{r} 9\frac{7}{8} \\ 8\frac{3}{10} \\ +2\frac{4}{5} \\ \hline \end{array}$	$\begin{array}{r} 4\frac{2}{5} \\ 1\frac{1}{6} \\ +2\frac{9}{10} \\ \hline \end{array}$	$\begin{array}{r} 8\frac{1}{6} \\ 6\frac{1}{9} \\ +4\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{9}{10} \\ 3\frac{3}{4} \\ +7\frac{2}{5} \\ \hline \end{array}$	$\begin{array}{r} 2\frac{3}{8} \\ 5\frac{1}{2} \\ +6\frac{3}{4} \\ \hline \end{array}$
18.	$7 \times \frac{2}{3}$	$\frac{5}{6} \times 42$	$\frac{3}{8} \times \frac{2}{5}$	$2\frac{2}{3} \times 1\frac{5}{8}$	$\frac{5}{6} \times 1\frac{5}{7}$
19.	$\frac{5}{6} \times 30$	$3\frac{2}{3} \times 15$	$3 \times \frac{1}{6}$	$2 \times 3\frac{1}{3}$	$4\frac{1}{6} \times \frac{2}{5}$
20.	$6 \div \frac{3}{5}$	$27 \div 45$	$1 \div \frac{5}{6}$	$\frac{8}{9} \div 4$	$\frac{14}{15} \div 7$
21.	$4\frac{3}{8} \div 5$	$10\frac{1}{2} \div 3$	$\frac{7}{16} \div 2$	$1\frac{7}{8} \div 5$	$1\frac{2}{3} \div 10$

22. $3\frac{1}{2}$ is what part of 14?

23. 2 is how many times $\frac{3}{4}$?

24. $3\frac{1}{7}$ is what part of 11?

25. 16 is how many times $2\frac{2}{3}$?

Dividing a Fraction by a Fraction

Like-fractions; quotient more than 1 [O]

1. Joan's mother says that each of her candy dishes will hold about $\frac{1}{8}$ lb. How many dishes can Joan fill from $\frac{5}{8}$ lb. of mints? $\frac{5}{8} \div \frac{1}{8} = ?$ That is, how many $\frac{1}{8}$'s are there in $\frac{5}{8}$?

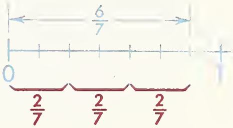
On your ruler find the $\frac{5}{8}$-inch mark. Count to find how many $\frac{1}{8}$'s there are in $\frac{5}{8}$.

In $\frac{5}{8} \div \frac{1}{8}$, is the dividend more or less than the divisor? Then will the quotient be more or less than 1?

Since $\frac{5}{8}$ and $\frac{1}{8}$ have the same fractional unit, why is it easy to use the common-denominator method? $\frac{5}{8} \div \frac{1}{8} = 5 \div 1 = ?$

2. $\frac{6}{7} \div \frac{2}{7} = ?$ In the diagram, count to find how many $\frac{2}{7}$'s there are in $\frac{6}{7}$.

Do $\frac{6}{7}$ and $\frac{2}{7}$ have the same fractional unit? Does $\frac{6}{7} \div \frac{2}{7} = 6 \div 2$? Why? Then $\frac{6}{7} \div \frac{2}{7} = ?$



3. On the board, check your answers for Ex. 1 and 2 by using the inversion method.

Quotient less than 1

4. $\frac{3}{8}$ is what part of $\frac{5}{8}$? That is, $\frac{3}{8} \div \frac{5}{8} = ?$
Will the quotient be more or less than 1? Why?
$\frac{3}{8} \div \frac{5}{8} = 3 \div 5$, or ‗?‗. Explain.

5. Is the inversion method or the common-denominator method easier when the fractional unit is the same?

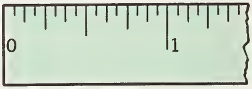
In rows 6 to 9, try to divide without pencil and paper.

	a	b	c	d	e
6.	$\frac{7}{8} \div \frac{1}{8}$	$\frac{9}{10} \div \frac{1}{10}$	$\frac{6}{7} \div \frac{1}{7}$	$\frac{11}{4} \div \frac{1}{4}$	$\frac{5}{3} \div \frac{1}{3}$
7.	$\frac{8}{9} \div \frac{2}{9}$	$\frac{9}{16} \div \frac{3}{16}$	$\frac{1}{8} \div \frac{3}{8}$	$\frac{4}{9} \div \frac{8}{9}$	$\frac{2}{5} \div \frac{3}{5}$
8.	$\frac{2}{3} \div \frac{2}{3}$	$\frac{4}{9} \div \frac{5}{9}$	$\frac{7}{12} \div \frac{5}{12}$	$\frac{1}{6} \div \frac{5}{6}$	$\frac{4}{5} \div \frac{4}{5}$
9.	$\frac{1}{2} \div \frac{5}{2}$	$\frac{8}{3} \div \frac{2}{3}$	$\frac{3}{20} \div \frac{9}{20}$	$\frac{25}{12} \div \frac{5}{12}$	$\frac{2}{15} \div \frac{8}{15}$

Dividing a Fraction by a Fraction

Unlike-fractions; quotient more than 1 [O]

1. Estimating that a slice of bacon weighs 1 ounce ($\frac{1}{16}$ lb.), Bill tried to think out how many slices of bacon there would be to eat if he fried $\frac{3}{4}$ pound. Can you find out?



You will have to find how many $\frac{1}{16}$'s there are in $\frac{3}{4}$. On the section of a ruler shown here, find the $\frac{3}{4}$ mark and count the $\frac{1}{16}$'s in $\frac{3}{4}$.

The work with figures is done in the box. Explain the work.

You can check the division as usual by multiplying the divisor and the quotient, as in the box. Explain.

$$\frac{3}{4} \div \frac{1}{16} = \frac{3}{4} \times \frac{16}{1}$$

$$\frac{3}{\underset{1}{\cancel{4}}} \times \frac{\overset{4}{\cancel{16}}}{1} = 12$$

Check

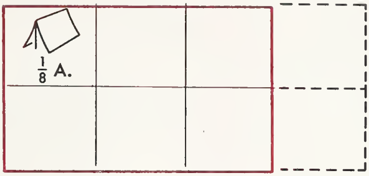
$$12 \times \frac{1}{16} = \frac{12}{16} = \frac{3}{4}$$

Could you use the common-denominator method here? How?

[W]

Copy, and divide by inverting the divisor and multiplying. Check your work as in the box.

	a	b	c	d	e
2.	$\frac{2}{3} \div \frac{1}{6}$	$\frac{3}{4} \div \frac{1}{8}$	$\frac{7}{8} \div \frac{1}{4}$	$\frac{5}{12} \div \frac{1}{3}$	$\frac{5}{6} \div \frac{1}{4}$
3.	$\frac{11}{12} \div \frac{3}{4}$	$\frac{5}{16} \div \frac{1}{4}$	$\frac{5}{6} \div \frac{2}{3}$	$\frac{3}{4} \div \frac{3}{16}$	$\frac{4}{5} \div \frac{1}{10}$
4.	$\frac{7}{8} \div \frac{2}{3}$	$\frac{3}{4} \div \frac{5}{8}$	$\frac{2}{3} \div \frac{3}{8}$	$\frac{13}{16} \div \frac{3}{4}$	$\frac{8}{9} \div \frac{2}{5}$



5. The camping area in which the boys stayed overnight covers about $\frac{3}{4}$ of an acre divided into $\frac{1}{8}$-acre tent sites. What part of the camping area was the boys' tent site?

The green lines of the diagram show the camping area. Why is the tent site, which is $\frac{1}{8}$ of the whole acre, not $\frac{1}{8}$ of the camping area? Count to find what part the $\frac{1}{8}$ A. is of the $\frac{3}{4}$ A.

Working with figures, to compare $\frac{1}{8}$ with $\frac{3}{4}$, we can write

$$\frac{1}{8} \div \frac{3}{4} = ?$$

Why will the quotient be a what-part-of number?

Explain the division in the box. Explain the check.

$$\frac{1}{8} \div \frac{3}{4} = \frac{1}{\underset{2}{\cancel{8}}} \times \frac{\overset{1}{\cancel{4}}}{3} = \frac{1}{6}$$

Check

$$\frac{1}{6} \times \frac{3}{4} = \frac{3}{24} = \frac{1}{8}$$

[W]

Copy and divide. Check as in the box.

	a	b	c	d	e
6.	$\frac{1}{3} \div \frac{1}{2}$	$\frac{1}{2} \div \frac{5}{6}$	$\frac{3}{8} \div \frac{5}{6}$	$\frac{2}{3} \div \frac{7}{8}$	$\frac{1}{4} \div \frac{7}{10}$
7.	$\frac{1}{5} \div \frac{1}{4}$	$\frac{2}{5} \div \frac{7}{10}$	$\frac{1}{8} \div \frac{3}{4}$	$\frac{1}{2} \div \frac{2}{3}$	$\frac{3}{5} \div \frac{9}{10}$
8.	$\frac{1}{4} \div \frac{7}{12}$	$\frac{1}{5} \div \frac{7}{15}$	$\frac{5}{12} \div \frac{5}{6}$	$\frac{1}{6} \div \frac{9}{10}$	$\frac{1}{8} \div \frac{9}{16}$
9.	$\frac{1}{4} \div \frac{4}{5}$	$\frac{5}{16} \div \frac{3}{8}$	$\frac{5}{6} \div \frac{11}{12}$	$\frac{5}{8} \div \frac{5}{6}$	$\frac{3}{5} \div \frac{2}{3}$

Write your work for problems 10 and 11.

10. The boys thought it would take them $\frac{3}{4}$ hr. to clean up the tent site and pack their equipment. They really spent only $\frac{3}{5}$ hr. What part of the estimated time did they use?

11. A sign on the mountain trail said, "$\frac{7}{8}$ mi. to the top." The boys stopped to rest after they had climbed for $\frac{1}{4}$ mi. What part of the total distance had they climbed?

Extra Practice. For more practice, work Sets 81–83.

Dividing by a Mixed Number

Dividend a fraction **[O]**

1. The Imperial gallon, used in Canada, is larger than the United States gallon. 1 Imperial gallon = $1\frac{1}{5}$ U. S. gallons. Mrs. Day of Toronto, while visiting in Buffalo, bought $\frac{3}{4}$ gal. of maple syrup. What part of an Imperial gallon did she get?

$\frac{3}{4} \div 1\frac{1}{5} = ?$

Which of these two numbers, $\frac{3}{4}$ or $1\frac{1}{5}$, is the smaller? Will the quotient be a what-part-of number or a how-many-times number?

Explain the work in box A.

On the board check the quotient by multiplying.

A

$\frac{3}{4} \div 1\frac{1}{5} = ?$

Side work

$1\frac{1}{5} = \frac{6}{5}$

$$\frac{3}{4} \div \frac{6}{5} = \frac{\overset{1}{\cancel{3}}}{4} \times \frac{5}{\underset{2}{\cancel{6}}} = \frac{5}{8}$$

[W]

For each of the following pairs of numbers, find what part the smaller number is of the larger and check your answer.

2. $\frac{2}{3}$, $3\frac{1}{3}$ **3.** $7\frac{1}{2}$, $\frac{1}{2}$ **4.** $1\frac{1}{2}$, $\frac{9}{10}$ **5.** $\frac{1}{3}$, $1\frac{1}{4}$

6. $\frac{7}{12}$, $2\frac{1}{3}$ **7.** $3\frac{3}{5}$, $\frac{8}{15}$ **8.** $\frac{7}{9}$, $6\frac{5}{6}$ **9.** $1\frac{1}{2}$, $\frac{1}{4}$

10. $\frac{5}{8}$, $1\frac{7}{8}$ **11.** $2\frac{1}{2}$, $\frac{5}{8}$ **12.** $3\frac{1}{3}$, $\frac{5}{6}$ **13.** $\frac{3}{8}$, $4\frac{1}{2}$

➤ **Extra Practice.** For more practice, work Sets 84 and 85.

B

How Many Times?

Don walked $12\frac{3}{4}$ mi., and Larry walked $4\frac{1}{2}$ mi. Don walked how many times as far as Larry?

Side work

$12\frac{3}{4} \div 4\frac{1}{2} = ?$

$12\frac{3}{4} = \frac{51}{4}$

$4\frac{1}{2} = \frac{9}{2}$

$$\frac{51}{4} \div \frac{9}{2} = \frac{\overset{17}{\cancel{51}}}{\underset{2}{\cancel{4}}} \times \frac{\overset{1}{\cancel{2}}}{\underset{3}{\cancel{9}}} = \frac{17}{6}, \text{ or } 2\frac{5}{6}$$

C

What Part Of?

Tom started for a camp $10\frac{1}{2}$ mi. away. What part of his hike had he covered after going $1\frac{3}{4}$ mi.?

Side work

$1\frac{3}{4} \div 10\frac{1}{2} = ?$

$1\frac{3}{4} = \frac{7}{4}$

$10\frac{1}{2} = \frac{21}{2}$

$$\frac{7}{4} \div \frac{21}{2} = \frac{\overset{1}{\cancel{7}}}{\underset{2}{\cancel{4}}} \times \frac{\overset{1}{\cancel{2}}}{\underset{3}{\cancel{21}}} = \frac{1}{6}$$

14. In problems B and C, we have to divide a mixed number by a mixed number. What do we do first with the mixed numbers? What kind of examples do we have then?

15. In problem B, why is the quotient a how-many-times number? In problem C, why is the quotient a what-part-of number?

16. If you know how to divide a fraction by a fraction, why is it easy to divide a mixed number by a mixed number?

For rows 17 to 21, tell whether each quotient will be a what-part-of number or a how-many-times number.

[W]

Divide by the inversion method. Check by multiplying.

	a	b	c	d	e
17.	$4\frac{1}{2} \div 1\frac{1}{2}$	$2\frac{3}{4} \div 4\frac{1}{2}$	$1\frac{1}{3} \div 2\frac{2}{3}$	$6\frac{2}{9} \div 1\frac{1}{3}$	$3\frac{1}{4} \div 1\frac{1}{2}$
18.	$6\frac{1}{4} \div 2\frac{1}{2}$	$4\frac{1}{2} \div 7\frac{1}{2}$	$7\frac{1}{3} \div 2\frac{1}{4}$	$1\frac{1}{2} \div 1\frac{1}{3}$	$2\frac{1}{2} \div 3\frac{1}{4}$
19.	$2\frac{1}{10} \div 1\frac{2}{5}$	$3\frac{3}{4} \div 1\frac{2}{3}$	$1\frac{1}{2} \div 4\frac{1}{2}$	$2\frac{1}{2} \div 4\frac{1}{6}$	$4\frac{1}{2} \div 3\frac{3}{8}$
20.	$2\frac{1}{4} \div 4\frac{1}{2}$	$2\frac{5}{8} \div 1\frac{3}{4}$	$2\frac{1}{2} \div 1\frac{3}{4}$	$1\frac{1}{8} \div 5\frac{5}{8}$	$1\frac{5}{9} \div 1\frac{2}{5}$
21.	$2\frac{1}{4} \div 2\frac{1}{2}$	$3\frac{1}{8} \div 1\frac{2}{3}$	$12\frac{3}{5} \div 4\frac{1}{2}$	$2\frac{1}{10} \div 3\frac{3}{5}$	$5\frac{1}{3} \div 3\frac{1}{9}$

Extra Practice. For more practice, work Sets 86 and 87.

Making Up Your Own Problems

D. of fractions and mixed numbers [W]

One day Miss Pike suggested that the pupils in her sixth-grade arithmetic class make up their own problems in division with fractions and mixed numbers. Some of the problems that her pupils wrote are given below.

Solve each problem, and then make another problem like it.

1. Tina: Mother gave me $4\frac{1}{2}$ yards of ribbon to cut into $\frac{3}{4}$-yard pieces for apron ties. How many ties could I make?

2. Bill: For our picnic Dad got $6\frac{1}{4}$ pounds of lobsters. They averaged $1\frac{1}{4}$ pounds apiece. How many did we have?

3. Anne: The dessert recipe called for $1\frac{1}{2}$ cups of milk. Mother found that she had only $\frac{3}{4}$ cup. How could she change the amounts in the recipe so that she could use only $\frac{3}{4}$ cup of milk? (That is, $\frac{3}{4}$ is what part of $1\frac{1}{2}$?)

4. Art: The weight marked on my chocolate bar is $8\frac{1}{3}$ ounces. What would half the bar weigh?

5. Pete: To give good measure, the man at the fruit stand puts $3\frac{1}{16}$ pounds of apples in the bags he sells as 3 pounds. How many bags could he fill from $24\frac{1}{2}$ pounds of apples?

6. Nell: How many $\frac{1}{4}$-hour radio programs could be planned for a $1\frac{1}{2}$-hour period?

Dividing with Fractions

A summary [O]

The chart below shows the kinds of division examples you have had in this chapter. Where two examples are in a box, one dividend is larger than the divisor and the other is smaller than the divisor. Tell for each example in the chart whether the quotient will be more or less than 1.

Dividend	**Divisor**		
	Whole number	Fraction	Mixed number
Whole number	1. $42 \div 12$ 2. $8 \div 30$	3. $5 \div \frac{5}{6}$	4. $8 \div 1\frac{1}{3}$ 5. $2 \div 4\frac{1}{2}$
Fraction	6. $\frac{3}{4} \div 6$	7. $\frac{2}{3} \div \frac{1}{6}$ 8. $\frac{1}{4} \div \frac{3}{8}$	9. $\frac{5}{8} \div 2\frac{1}{4}$
Mixed number	10. $8\frac{3}{8} \div 6$ 11. $1\frac{1}{2} \div 3$	12. $4\frac{2}{3} \div \frac{5}{6}$	13. $6\frac{2}{3} \div 3\frac{1}{3}$ 14. $4\frac{1}{2} \div 6\frac{1}{2}$

[W]

1–14. Work all the examples in the chart by inversion.

Copy, divide by the inversion method, and check.

	a	b	c	d	e
15.	$5\frac{1}{2} \div 1\frac{3}{4}$	$14 \div \frac{7}{8}$	$12 \div 42$	$7 \div \frac{1}{5}$	$4\frac{1}{5} \div 7$
16.	$2\frac{1}{12} \div \frac{5}{6}$	$8\frac{1}{4} \div 3\frac{1}{4}$	$\frac{3}{8} \div 6$	$1\frac{2}{3} \div 3\frac{1}{3}$	$\frac{5}{8} \div \frac{15}{16}$
17.	$7\frac{7}{8} \div \frac{3}{4}$	$\frac{7}{8} \div 2\frac{11}{12}$	$68 \div 6$	$7\frac{2}{10} \div \frac{4}{5}$	$2\frac{2}{3} \div 8\frac{1}{3}$
18.	$18\frac{3}{4} \div 2\frac{1}{2}$	$2\frac{1}{7} \div 5$	$\frac{4}{5} \div 12$	$24 \div 60$	$6 \div 1\frac{4}{5}$
19.	$12 \div \frac{4}{5}$	$6 \div 4\frac{1}{2}$	$3\frac{3}{8} \div 6\frac{3}{4}$	$\frac{3}{8} \div \frac{1}{4}$	$\frac{5}{6} \div 3\frac{3}{4}$
20.	$10 \div \frac{2}{3}$	$3 \div 7\frac{4}{5}$	$\frac{5}{12} \div \frac{1}{3}$	$9\frac{1}{2} \div 4\frac{3}{4}$	$\frac{3}{8} \div \frac{5}{12}$

Extra Practice. For more practice, work Sets 88 and 89.

To divide with fractions, first change whole numbers and mixed numbers to fractions. Then you can invert the divisor and multiply. Cancel if you can.

Bill's Rabbits

M. and D. problems with fractions [O]

In some of these problems you multiply, in others you divide. Tell what to do to find each answer.

1. Each day Bill feeds his rabbits $4\frac{1}{2}$ lb. of feed. How long will 100 lb. of feed last?

2. The feed costs Bill about $5\frac{3}{4}$¢ a pound. If he uses $4\frac{1}{2}$ lb. a day, about what is the daily cost of the feed?

3. One day Bill sold rabbits of the following weights: $5\frac{1}{8}$ lb., $3\frac{5}{8}$ lb., $5\frac{1}{4}$ lb., and $5\frac{1}{2}$ lb. What was the average weight of the rabbits sold that day?

4. In July, Bill received 25 dollars for the rabbits he sold. His expenses that month were $18\frac{3}{4}$ dollars. What part of the money that he received did he pay in expenses?

5. With some of the money he earned, Bill bought $\frac{3}{8}$ lb. of candy which sold for 72¢ a pound. How much did he pay?

6. If Bill's rabbits average $4\frac{7}{8}$ lb. and sell at 40¢ a pound, how much does he get for an average-sized rabbit?

7. One day Bill had an order for about 20 lb. of rabbits. If his rabbits averaged $4\frac{7}{8}$ lb., about how many rabbits would be needed? (Round to the nearest whole number.)

8. If Bill mixes $\frac{3}{8}$ lb. of insect powder in 6 gal. of water, how much powder is used per gallon?

9. Bill used $2\frac{3}{4}$ yd. of wire for each cage for his rabbits. How many yards of wire did he use for 5 cages?

10. For the cages, how many glass containers holding $\frac{3}{16}$ qt. can be filled with water from a quart bottle which is $\frac{3}{4}$ full?

11. If it takes $1\frac{1}{2}$ hr. to drive to the city, what part of the distance will Bill and his father drive in $\frac{3}{4}$ hr.?

12. Bill's father bought $12\frac{3}{10}$ gal. of gasoline at $27\frac{1}{2}$¢ a gallon. How much did he pay for it? (In the answer count any fraction of a cent as 1¢ more.)

13. Bill and his father left the car at a parking lot and walked $\frac{3}{4}$ mi. to the City Market. If a city block is $\frac{1}{20}$ mi., how many blocks did they walk?

[W]

Now go back and solve problems 1–13.

Oral Exercises

1. In division, when is the quotient less than 1?

2. $\frac{8}{11} \div 4 = ?$ How do you find the quotient quickly?

3. Tell the smallest common denominator for $\frac{1}{6}$ and $\frac{1}{8}$.

4. Is $\frac{5}{6} \times \frac{2}{3}$ equal to $\frac{2}{3} \times \frac{5}{6}$? Explain.

5. What is the first step in dividing 6 by $2\frac{2}{3}$?

6. What is the first step in dividing $\frac{2}{3}$ by 4?

7. How many $\frac{1}{2}$'s are there in 7 wholes?

8. To find $\frac{1}{2}$ of 5, can you write "$\frac{1}{2} \div 5 = \frac{1}{2} \times \frac{1}{5}$"?

9. How many $\frac{3}{10}$'s are there in $\frac{9}{10}$?

Finding n

Factor-product relationship [O]

A

$5 \times 7 = n$ $\quad$ $5 \times n = 35$ $\quad$ $n \times 7 = 35$

1. In the first example in box A, **n** stands for a missing product. In the other two examples, **n** stands for a missing _?_. Explain how to find **n** in each example.

2. If you know all the factors, explain how to find the product.

3. If you know a product and one of its two factors, how do you find the missing factor?

The relationship between a product and its factors is the same for whole numbers, fractions, and mixed numbers.

4. $\frac{1}{7} \times 14 = n$. In this example, **n** is the _?_ of $\frac{1}{7}$ and 14. Explain how to find the value of **n**.

5. In the example $\frac{1}{7} \times n = 2$, a product and one of its _?_ are given. To find **n**, the missing factor, why can you divide the product by the known factor? On the board, divide 2 by $\frac{1}{7}$ and see if you get the missing factor. Then explain how to find **n** in $n \times 14 = 2$.

6. Explain how to find **n** in each of the following:

a. $\frac{3}{5} \times \frac{5}{7} = n$ $\quad$ **b.** $4\frac{1}{2} \times n = 3$ $\quad$ **c.** $n \times \frac{3}{10} = \frac{1}{4}$

d. $\frac{7}{16} \times n = \frac{7}{12}$ $\quad$ **e.** $8 \times 5\frac{3}{4} = n$ $\quad$ **f.** $n \times 3\frac{1}{7} = 66$

7. In $35 \div 5 = 7$, which number is the dividend? the divisor? the quotient? Can we think of the dividend as the product of the divisor and the quotient? Explain. Using what you know about a product and its factors, explain how to find **n** in each of the examples in box B.

B

$35 \div n = 5$

$35 \div 7 = n$

$35 \div 5 = n$

$35 \div n = 7$

8. In $2 \div \frac{1}{7} = 14$, which number is the dividend? the divisor? the quotient? Which number can we think of as a product? Which numbers are its factors?

9. Explain how we make use of the relationship between a product and its factors when we check our answer to a division example.

10. Explain how to find **n** in $2 \div \frac{1}{7} = n$.

11. To find **n** in $2 \div n = 14$, why can we divide 2 by 14? Prove your answer by working the example on the board.

12. Explain the work in boxes C and D.

C

$$\frac{1}{2} \div n = \frac{2}{3};\ n = \frac{1}{2} \div \frac{2}{3} = \frac{1}{2} \times \frac{3}{2} = \frac{3}{4}$$

D

$$\frac{1}{2} \div \frac{3}{4} = n;\ n = \frac{1}{2} \div \frac{3}{4} = \frac{1}{\underset{1}{\cancel{2}}} \times \frac{\overset{2}{\cancel{4}}}{3} = \frac{2}{3}$$

13. Tell what you would do to find **n** in each of Ex. a–f.

a. $\frac{3}{5} \div n = 4\frac{1}{2}$
b. $\frac{7}{8} \div \frac{1}{2} = n$
c. $8 \div 3\frac{3}{7} = n$
d. $33 \div n = 5\frac{1}{2}$
e. $\frac{9}{10} \div n = \frac{2}{5}$
f. $2\frac{4}{5} \div 9\frac{1}{3} = n$

Whenever we know a product and one of its two factors, we can find the missing factor by dividing the product by the known factor.

[W]

Find **n** in each of Ex. 14–25. Write all your work.

14. $n \times \frac{5}{12} = 3\frac{3}{4}$
15. $\frac{7}{8} \times n = 28$
16. $1\frac{7}{8} \div n = \frac{5}{6}$
17. $7\frac{3}{4} \div 2 = n$
18. $n \times 8\frac{2}{5} = 42$
19. $9 \div 3\frac{3}{5} = n$
20. $\frac{11}{12} \div n = 7\frac{1}{3}$
21. $3\frac{7}{8} \times n = 7\frac{3}{4}$
22. $n \times 3\frac{3}{5} = 9$
23. $5 \div 8\frac{3}{4} = n$
24. $3\frac{1}{2} \div n = \frac{5}{12}$
25. $8\frac{3}{4} \times n = 5$

Three Kinds of Problems in M. and D.

With whole numbers [O]

When you understand how a product and its factors are related, you have mastered one of the most important ideas of arithmetic. You have often used this idea in solving problems with whole numbers. Sometimes you have multiplied two factors together to find a product; sometimes you have divided a product by one factor to find the other factor.

You know that a divisor or a quotient can be thought of as a factor of the dividend. For this reason, we can state any problem of this kind as a multiplication example, using **n** to stand for the missing number. Study Ex. 1–3 to see how this works.

1. Rae has 6 tropical fish. Nancy has 3 times as many. How many fish does Nancy have? (Is $3 \times 6 = n$ a correct statement of the example? Tell how to find **n**.)

2. Nancy has 18 tropical fish, and Rae has 6. Nancy has _?_ times as many fish as Rae. (Is $n \times 6 = 18$ a correct statement of the example? Tell how to find **n**.)

3. Nancy has 18 tropical fish. This is 3 times as many fish as Rae has. How many fish has Rae? (Is $3 \times n = 18$ a correct statement of the example? Tell how to find **n**.)

We work just the same way when the product and its factors are fractions or mixed numbers. It helps us to understand the problem question if we think of each problem as belonging to one of these three kinds, or types:

Type I. We know two factors. We want to find their product.

Type II. We know the product and one of its factors. We want to find the *ratio* factor—that is, the factor that shows how the product and the known factor are related. The ratio factor is either a how-many-times number or a what-part-of number.

Type III. We know the product and the *ratio* factor. We want to find the other factor.

The boxes below show how to work each type of problem. Study the work and see if you understand every step.

Finding the product. Ralph swam 75 yd. Joe swam $\frac{3}{5}$ as far. How far did Joe swim? $\frac{3}{5} \times 75 = n$ **You know the two factors.** $n = ?$ **You multiply to find the product.**	Type I $\frac{3}{5} \times 75 = n$ Multiply
Finding the factor which shows a relationship, or ratio. Ralph swam 75 yd., and Joe swam 45 yd. Joe's distance was what part of Ralph's? $n \times 75 = 45$ **You know the product and one factor.** $n = 45 \div 75 = \frac{45}{75} = \frac{?}{?}$ **You divide to find the missing factor.** The answer, $\frac{3}{5}$, tells us that Joe's distance was $\frac{3}{5}$ of Ralph's. Is it a how-many-times number or a what-part-of number? The answer to a Type II problem shows the relation between the product and the known factor. It may be a what-part-of number or a how-many-times number.	Type II $n \times 75 = 45$ Divide
Finding the other factor when the given factor is the ratio. Joe swam 45 yd. This was $\frac{3}{5}$ as far as Ralph swam. How far did Ralph swim? $\frac{3}{5} \times n = 45$ **You know the product and one factor.** $n = 45 \div \frac{3}{5} = 45 \times \frac{5}{3} = ?$ **You divide to find the missing factor.**	Type III $\frac{3}{5} \times n = 45$ Divide

Tell which type of fraction problem each of these is:

4. Sam's father planted $\frac{3}{4}$ of a 12-acre lot in corn. How many acres did he plant in corn? ($\frac{3}{4} \times 12 = n$)

5. The meat of a pecan is $\frac{2}{5}$ of the weight of the nut. How many pounds of whole pecans are needed to make 10 lb. of nut meats? ($\frac{2}{5} \times n = 10$)

6. Of the 36 books on a shelf, 20 books are histories. What part of the books are histories? ($n \times 36 = 20$)

Three Kinds of Problems

[O]

Give the example you would use for each problem and tell which kind it is (Type I, II, III).

1. Mrs. Wait had saved \$20. She spent $\frac{3}{4}$ of it for a jacket. How much did the jacket cost?

2. A grocer sold 140 oranges out of a box of 196 oranges. What part of the box did he sell?

3. A pail which was $\frac{2}{3}$ full contained 6 qt. of milk. How many quarts would the pail hold if full?

4. Jim has walked $\frac{3}{4}$ mi. of a $4\frac{1}{2}$-mile hike. What part of the hike has he walked?

5. Joe was to have $\frac{2}{5}$ of all the cherries he picked. If his share was 18 qt., how many quarts did he pick in all?

6. In a year Miss Reed saved \$234 by putting aside $\frac{3}{20}$ of her salary. What was her salary?

7. $\frac{3}{16}$ of a farm of 300 acres is a wood lot. How many acres are there in the wood lot?

8. We are trying to raise \$500 for playground equipment. We now have \$240. What part of the total have we raised?

9. When Bob has read 40 pages of a story of 90 pages, what part of the whole story has he read?

[W]

Now go back and write your work for Ex. 1–9.

Find **n** in each example below. Write all your work.

	a	b	c
10.	$36 = \frac{1}{4}$ of n	$5 = n \times 60$	$\frac{4}{5}$ of $30 = n$
11.	$6 = \frac{3}{5}$ of n	$\frac{2}{3}$ of $\frac{6}{10} = n$	$\frac{3}{8}$ of $n = 72$
12.	$4 \times n = 10$	$\frac{4}{3}$ of $9 = n$	$\frac{1}{4} = n \times 5$

Extra Practice. For more practice, work Set 90.

Thinking about What You Have Learned

[W]

Write your answers.

1. On a city map a small park is $\frac{3}{8}$ in. long. The scale of the map is *1 in. = 1,000 ft.* How many feet long is the park?

2. Show on a number line that $1\frac{1}{2} \div \frac{3}{4} = 2$.

3. Copy these multiplication statements and label in each the multiplicand, the multiplier, and the product:

a. $\begin{array}{r} 73 \\ \times 5 \\ \hline 365 \end{array}$ **b.** $\frac{2}{3} \times 6 = 4$ **c.** $8 \times \frac{4}{5} = 6\frac{2}{5}$ **d.** Seven $\frac{1}{4}$'s $= 1\frac{3}{4}$

4. Copy and show how to use cancellation in $\frac{3}{4} \times 3\frac{1}{3}$.

5. Round to the nearest whole number:

a. $7\frac{2}{3}$ **b.** $3\frac{2}{3}$ **c.** $6\frac{7}{8}$ **d.** $2\frac{4}{9}$

6. Find the product of $3\frac{1}{4}$ and 28 without changing $3\frac{1}{4}$ to an improper fraction.

7. Copy these division statements and label the dividend, the divisor, and the quotient: **a.** $3 \div \frac{1}{2} = 6$; **b.** $\frac{1}{3} \div 5 = \frac{1}{15}$.

8. a. Since $3 \div \frac{3}{4} = 4$, then $6 \div \frac{3}{4} = ?$
b. Since $12 \div \frac{1}{3} = 36$, then $12 \div \frac{2}{3} = ?$

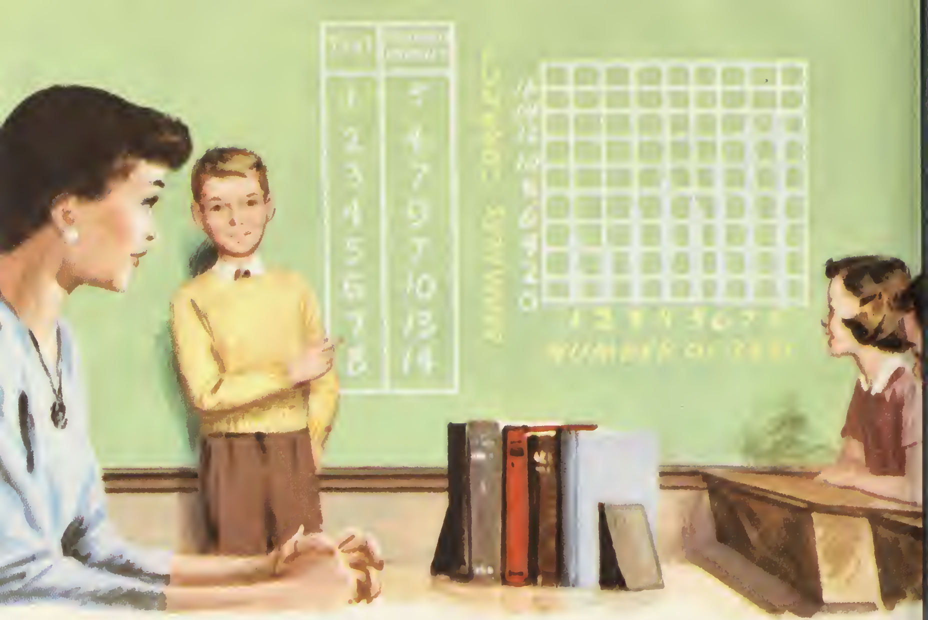
9. Show with an example that if the dividend is more than the divisor, the quotient is more than 1.

10. Show with an example that dividing a smaller number by a larger is finding what part the smaller number is of the larger.

11. Give an example to show that when 1 is divided by a fraction, the answer is the fraction inverted.

12. Write the division statement in which $\frac{3}{10}$ is the divisor, $\frac{3}{5}$ is the dividend, and 2 is the quotient.

13. Write in your own words the rule for division with fractions by the inversion method.



A Graph Showing Change

Line graph from bar graph [O]

Each month Miss Pike gave her class an arithmetic test with 15 questions. At the end of 8 months, Ken made a table to show the number of correct answers he had had on each test. Then he made a graph of these test scores.

Miss Pike asked Ken to put his work on the board so she could show the class something new about graphs. She asked the following questions. Can you answer them from Ken's work?

1. What two things does the table show?

2. What two things can you tell from the graph?

3. How can you tell from the graph whether Ken's arithmetic tests became better or worse as the year moved along?

4. On which test did Ken get the best score? the poorest?

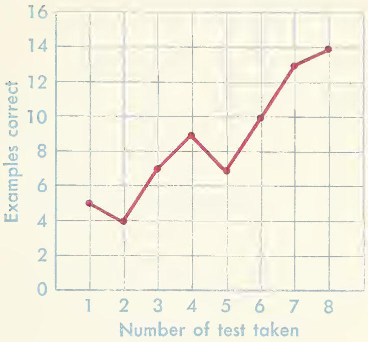
5. What kind of graph do we call this one on the board?

Miss Pike said that there is a kind of graph which shows more clearly than the vertical-bar graph whether a change is taking place for the better or for the worse. She put on the board a graph like the one at the right just below.

6. Instead of making bars, Miss Pike put a dot where the top of each bar would be. Read the number of examples correct for each test.

Then what did she do to make the line?

We call this kind of graph a **line graph.** It is used often to show a change which is taking place.



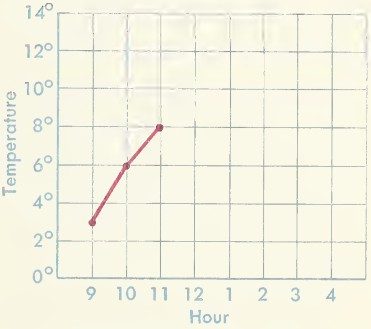
Examples Correct on Monthly Tests

What change would you say has taken place in Ken's work on his tests?

What does it mean when the line goes up? down?

[W]

7. On a very cold day, Ted wrote down the temperature every hour from 9 to 4. Copy the graph at the right and finish it from the table below.



Temperature Every Hour

Time	Temperature	Time	Temperature	Time	Temperature
9 A.M.	3°	12 M.	10°	3 P.M.	8°
10 A.M.	6°	1 P.M.	9°	4 P.M.	5°
11 A.M.	8°	2 P.M.	10°		

The Number of Telephones in the World in a Recent Year

Continent	Total telephones	Automatic (or dial)
North America	43,948,000	29,463,000
South America	1,657,000	1,215,000
Europe	20,000,000	12,900,000
Africa	806,000	525,000
Asia	2,367,000	978,000
Oceania	1,522,000	949,000

Reading a Table of Large Numbers

Comparing items [O]

The table above tells the number of telephones in the world by continents in a recent year and also the number of those telephones which are automatic (or dial).

The first line across is read this way:

"North America had in all 43,948,000 telephones. Of these, 29,463,000 were dial telephones."

1. Read the second line; the other lines.

2. Do you think that the numbers given in the table are *exact* numbers? Explain your answer.

3. Which continent had the most telephones? the fewest?

4. On which continent were fewer than half the telephones automatic?

5. Which two continents had about the same number of dial telephones?

6. Which two continents had about the same number of telephones in all?

7. Using the numbers in the table, find on the board about how many telephones there were in the world that year.

8. In a bar graph made from the table above, for which continent would the bar be longest? shortest?

Graphing Large Numbers

Line and bar graphs [O]

1. Why do you think large numbers are more often graphed than small ones?

2. We can make large numbers more usable by rounding them. Round 385,160 to ten thousands.

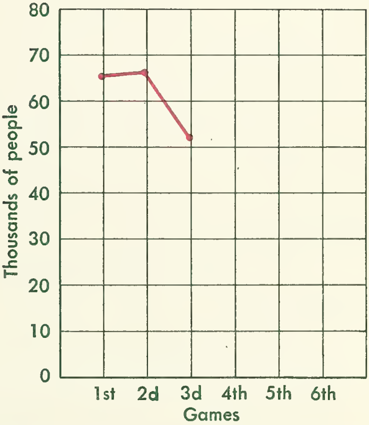
3. When you round 385,160, you can think of it as about 390,000 or as about 39 ten thousands. Which way of rounding would be easier to use in making a graph? Explain.

[W]

4. In a recent year the paid attendance at the World Series games was as follows:

1st game,	65,673
2d game,	66,804
3d game,	52,035
4th game,	49,010
5th game,	47,530
6th game,	61,711

Make a table showing each of the numbers above as a number of thousands. (65,673 rounded to the nearest thousand is _?_, so the first number in your table will be 66.)



Attendance at a Recent World Series

5. Copy and complete the line graph at the right above. Use the table you made for Ex. 4. Make the vertical scale: $\frac{1}{2}$ *in. = 10 (thousand people).*

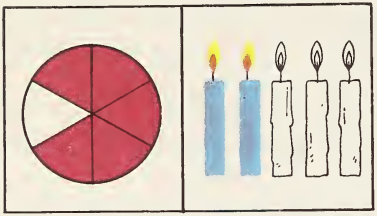
6. On one round-trip voyage a large ocean liner carried 70,000 lb. of meat, 25,000 lb. of poultry, 12,000 lb. of fish, 60,000 lb. of potatoes, 30,000 lb. of fresh vegetables, 10,000 lb. of frozen vegetables, and 12,000 lb. of sugar. Show these facts by a horizontal-bar graph. You can use the following scale: $\frac{3}{8}$ *in. = 10 (thousand pounds).*

Oral Exercises

1. In $\frac{5}{16}$, what tells the number of parts in the fraction?

2. Use $\frac{3}{4}$ to explain what "fractional unit" means.

3. In $\frac{2}{3}$ c., what is the fractional unit? How many equal parts are there in this fraction?



4. What part of the circle is colored? What part of the group of candles?

5. Joe has 5¢ and Ted 8¢. Tell the ratio of Joe's money to Ted's.

6. In the fraction $\frac{7}{16}$, which number is the divisor?

7. If you multiply both terms of $\frac{4}{5}$ by 3, what change do you make in the fraction? What change do you not make?

8. If you divide both terms of $\frac{9}{12}$ by 3, what is changed? What is not changed?

9. Give the missing numbers: **a.** $\frac{2}{3} = \frac{?}{9}$ **b.** $2\frac{5}{10} = 2\frac{?}{2}$
c. $\frac{20}{5} = ?$ **d.** $\frac{19}{8} = 2\frac{?}{8}$ **e.** $2\frac{3}{5} = \frac{?}{5}$ **f.** $\frac{15}{24} = \frac{5}{?}$

10. $\frac{4}{9}$ means the ratio of _?_ to _?_.

11. What is the ratio of a foot to an inch? of an inch to a foot? of a quart to a gallon? of a mile to a foot?

12. In one school 4 out of every 5 of the pupils are right-handed. What part of the pupils are right-handed?

13. Read as division: $\frac{2}{3}$; $\frac{86}{17}$; $\frac{3}{5}$; $\frac{2}{1}$.

14. Change to best form: $\frac{16}{3}$; $\frac{9}{5}$; $\frac{11}{11}$; $\frac{10}{2}$; $\frac{21}{9}$; $\frac{32}{6}$.

15. What is the smallest common denominator for each pair of fractions? **a.** $\frac{1}{2}, \frac{3}{4}$; **b.** $\frac{5}{6}, \frac{2}{3}$; **c.** $\frac{1}{3}, \frac{1}{2}$; **d.** $\frac{1}{4}, \frac{1}{6}$.

16. Add: **a.** $\frac{1}{2} + \frac{7}{2}$; **b.** $\frac{3}{10} + \frac{2}{5}$; **c.** $2\frac{5}{8} + \frac{3}{4}$; **d.** $1 + \frac{2}{3} + 4\frac{1}{3}$.

17. Subtract each number from 3: $\frac{1}{4}$; $1\frac{3}{5}$; $\frac{7}{10}$; $2\frac{1}{8}$; $\frac{14}{7}$.

Can You Solve Problems?

Problem Test 5

1. Mr. Henry says that his machine can fill bottles at the rate of 1 every $\frac{4}{5}$ sec. How many can it fill in 1 minute?

2. Dick's notebook has 100 pages. If Dick has used 60 pages of his notebook, what part of it is used up?

3. Mary has 5 apples. If she needs $\frac{1}{3}$ of an apple for each portion of a salad, how many portions can she make?

4. A telephone crew averages $1\frac{1}{2}$ mi. a day in laying cable. How many days will it take this crew to lay 20 mi. of cable?

5. A meat cutter wrapped $1\frac{1}{8}$ lb. of hamburger in each package for the freezer. How many packages could he get from $15\frac{3}{4}$ lb. of hamburger?

6. Mr. James owns $26\frac{1}{2}$ A. of cotton. He picked $2\frac{2}{3}$ A. to get a bale of cotton. At that rate, how many bales can he make?

7. How many notebooks $\frac{3}{8}$ in. thick are there in a stack 9 in. high?

8. John says that he can walk $3\frac{1}{2}$ mi. an hour. At that rate, how long would it take him to walk $\frac{7}{8}$ mi.?

9. Mrs. Hall bought $\frac{3}{4}$ yd. of tapestry. She used $\frac{1}{2}$ yd. to cover a cushion. What part of the piece did she use?

Do You Understand?

Test of Information and Meaning 5

1. What division method is used in Ex. A? in Ex. B?

2. In Ex. B which number is the divisor?

A $3 \div \frac{2}{3} = \frac{9}{3} \div \frac{2}{3} = 4\frac{1}{2}$

B $\frac{1}{2} \div \frac{2}{3} = \frac{1}{2} \times \frac{3}{2} = \frac{3}{4}$

3. In division by a fraction, what does "invert" mean?

4. The example, $6 \div \frac{3}{4} = ?$ is usually read "six divided by $\frac{3}{4}$ is what?" Ask this question another way.

5. In $5 \div 6\frac{2}{3}$ what would be the common denominator?

6. Write the example that you would use to solve Ex. C by the inversion method.

7. In which example (A, B, C, D, E, or F), is a fraction divided by a whole number?

C $4\frac{1}{2} \div 2 = ?$

D $3\frac{1}{5} \div 1\frac{2}{3} = ?$

E $\frac{5}{6} \div 4 = ?$

F $7 \div 1\frac{3}{4} = ?$

8. In which examples is a mixed number the dividend?

9. In which example is a whole number divided by a fraction?

10. Write the example that you would use to solve Ex. F by the common-denominator method.

11. Write for Ex. F the example you would use to solve by inverting the divisor.

12. In order to show large numbers on a graph, what can you do to make the numbers easy to use?

13. How is a line graph different from a bar graph?

14. In a recent year, Mr. Haspel sold fruit from his orchard as follows: plums, 198 bu.; peaches, 826 bu.; cherries, 162 bu.; apples, 1,432 bu. Round these numbers to hundreds and make a horizontal-bar graph to show these sales.

Do You Make Mistakes?

Diagnostic Test 5

					Study Pages	Practice Sets
	Use the common-denominator method in rows 1 and 2.					
	a	b	c	d		
1.	$8 \div \frac{3}{4}$	$5 \div \frac{2}{3}$	$6 \div \frac{5}{8}$	$12 \div \frac{4}{5}$	175–178	72–73
2.	$6 \div 2\frac{1}{2}$	$10 \div 3\frac{1}{3}$	$4 \div 1\frac{3}{8}$	$7 \div 2\frac{1}{5}$	179	74–75
	Invert the divisor and multiply in rows 3–6.					
3.	$\frac{7}{8} \div 6$	$\frac{3}{4} \div 5$	$\frac{2}{3} \div 7$	$\frac{4}{5} \div 8$	186–187	76–77
4.	$1\frac{2}{3} \div 6$	$4\frac{1}{2} \div 2$	$3\frac{3}{4} \div 8$	$2\frac{5}{8} \div 4$	188–189	78–80
5.	$\frac{2}{3} \div \frac{1}{8}$	$\frac{7}{8} \div \frac{2}{5}$	$\frac{1}{6} \div \frac{4}{5}$	$\frac{3}{4} \div \frac{5}{6}$	193–195	81–83
6.	$\frac{1}{2} \div 2\frac{1}{2}$	$\frac{2}{3} \div 1\frac{1}{2}$	$4\frac{2}{3} \div 1\frac{1}{4}$	$1\frac{5}{8} \div 4\frac{2}{3}$	196–197	84–87

How Well Can You Figure?

Computation Test 5

Work the examples in rows 1 and 2 by using common denominators.

	a	b	c	d	e
1.	$3 \div \frac{2}{5}$	$2 \div 1\frac{1}{2}$	$4 \div 5\frac{1}{2}$	$5 \div \frac{3}{4}$	$6 \div 2\frac{3}{4}$
2.	$\frac{3}{4} \div \frac{5}{16}$	$\frac{9}{10} \div \frac{4}{15}$	$3\frac{1}{7} \div \frac{1}{2}$	$\frac{11}{12} \div \frac{3}{8}$	$1\frac{1}{6} \div \frac{3}{4}$

For the examples below, divide by inverting the divisor and multiplying.

3.	$\frac{2}{3} \div \frac{3}{4}$	$\frac{7}{8} \div \frac{3}{4}$	$\frac{5}{6} \div \frac{5}{8}$	$\frac{9}{16} \div 1\frac{1}{2}$	$\frac{7}{8} \div 2\frac{1}{2}$
4.	$7\frac{1}{2} \div \frac{4}{5}$	$5\frac{1}{3} \div \frac{4}{9}$	$8\frac{1}{3} \div 2\frac{1}{2}$	$3\frac{3}{4} \div 5\frac{1}{4}$	$6\frac{2}{3} \div 3\frac{1}{3}$

Check your quotients for row 3 by multiplying the divisor by the quotient.

6

George Brighton, out of 457 contestants, won the local Soap Box Derby Championship today. It was his fifth try at the races. He entered for the first time when he was 11 years old.

In the Championship race, George's car covered the 450-foot distance in 17.9 seconds.

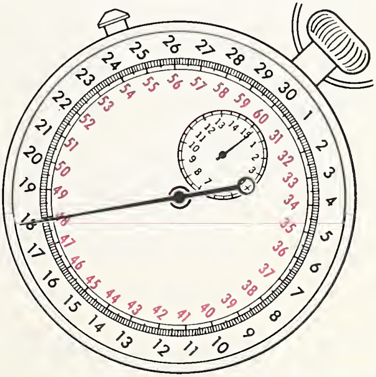
The Soap Box Derby Champion

Meaning of tenths [O]

1. From the newspaper clipping on the opposite page, read the time George's car took to cover the Derby course.

To help Sue, who was in the fourth grade, read the number 17.9, George covered the .9 and had her say "17." He then told her to say "and" for the point and "nine tenths" for the 9. Sue then read "seventeen and nine-tenths seconds."

George now wrote the **decimal fraction** ".9" and told Sue that this means the same as $\frac{9}{10}$. Why would it have been better to write "0.9" instead of ".9"?



2. To time a race, a stop watch like the one shown in the picture can be used. The numbers around the outside of the dial mean seconds.

a. How many spaces are there between 17 and 18? What part of a second does each space represent?

b. Read the table at the right and tell where the hand would point for each number in the table.

c. On the stop watch, can you figure out why the red numbers are there? where is the minute hand?

17.0	seventeen
17.1	seventeen and 1 tenth
17.2	seventeen and 2 tenths
17.3	seventeen and 3 tenths
17.4	seventeen and 4 tenths
17.5	seventeen and 5 tenths
17.6	seventeen and 6 tenths
17.7	seventeen and 7 tenths
17.8	seventeen and 8 tenths
17.9	seventeen and 9 tenths
18.0	eighteen

3. Read the following numbers. (Remember that 0 at the left of the point means that there is no whole number.)

a. 25.4 **b.** 0.8 **c.** 245.6 **d.** 8,275.3 **e.** 85.7

Reading and Writing Tenths

With common and decimal fractions [O]

Read Ex. 1–7 and explain each decimal number.

1. A new local race track for the Soap Box Derby has been built with a racing distance of 975.4 feet.

2. Mr. Ames bought 12.6 gallons of gasoline.

3. The stopping distance for a car going 30 miles an hour is 100.5 feet. The car moves 67.5 feet of that distance while the brake is being pushed down.

4. The stopping distance for a car going 50 miles an hour is 242.5 feet. The car moves 187.5 feet while the brake is being pushed down.

5. When the Blairs got home from their vacation, the mileage meter on their new car showed a total of 1,826.7 miles.

6. One of the newest airplanes costs 1.8 million dollars.

7. The rainfall this month was reported as 3.2 inches.

8. In sentence 1, above, why may we write the number as "$975\frac{4}{10}$" if we wish to?

9. At the board, write each of the numbers in Ex. 2–7 with a fraction having the fraction bar. (We call this kind of fraction a common fraction.) Then read each sentence again, using the number you wrote on the board.

[W]

10. What do you notice about the number of 0's in the denominator of the common fraction and the number of places at the right of the decimal point in the decimal fraction?

11. Write these numbers with common fractions:

a. 0.5 **b.** 28.3 **c.** 529.4 **d.** 8,240.5 **e.** 75,629.8

12. Write these numbers with decimal fractions:

a. $9\frac{1}{10}$ **b.** $45\frac{3}{10}$ **c.** $785\frac{8}{10}$ **d.** $4{,}872\frac{9}{10}$ **e.** $21{,}572\frac{5}{10}$

To show meaning

In the number 9,542.7, when you cover the point and the 7 tenths, you see the whole number which means 9 thousands, 5 hundreds, 4 tens, and 2 ones. Then as you continue to the right beyond the point, you have the new tenth's place. The point (usually called **decimal point**) separates the whole number from the decimal fraction.

A

Thousands		Hundreds	Tens	Ones		Tenths
9	,	5	4	2	.	7

We can take a decimal number apart figure by figure just as we take a whole number apart. Study box B.

13. The number 84.6 is called a **mixed decimal**. This number is the sum of how many products? (Use box B for help.)

14. Box C shows three other ways to explain the meaning of the mixed decimal 84.6 Read each line in the box.

B

In 84.6,

the 8 means 8 tens,	or 8×10,		or 80
the 4 means 4 ones,	or 4×1,		or 4
the 6 means 6 tenths,	or $6 \times \frac{1}{10}$,	or $\frac{6}{10}$,	or 0.6
			84.6

C

84.6 means
8 tens and 4 ones and 6 tenths;
or 84 ones and 6 tenths;
or 846 tenths.

[W]

15. Copy chart A, above, and write in it the following mixed decimals with each figure in the correct column:

a. 25.6 **b.** 17.4 **c.** 893.2 **d.** 6,297.3 **e.** 478.5

16. As in boxes B and C, write the meaning of 832.7; 402.6

Adding and Subtracting Tenths

Meaning [O]

1. It is 1.7 miles from City Park to the Scout Camp. When the boys started from the park, the cyclometer on Jim's bicycle registered 72.6 miles. What did it show when he got to Camp?

A

Using Common Fractions

$$\begin{array}{r} 1\frac{7}{10} \\ +72\frac{6}{10} \\ \hline 73\frac{13}{10} = 74\frac{3}{10} \end{array}$$

Side work

$$\frac{13}{10} = 1\frac{3}{10}$$

$$73\frac{13}{10} = 73 + 1\frac{3}{10}\text{, or } 74\frac{3}{10}$$

B

Using Decimals

$$\begin{array}{r} \overset{1}{1}.7 \\ +72.6 \\ \hline 74.3 \end{array}$$

a. Of course the number of miles Jim rode to camp, 1.7, is to be added to the 72.6 miles already on the meter. Do the decimal fractions in both of these numbers have the same fractional unit? What is it?

b. If you had no idea how to add with decimal fractions, you could use common fractions, as in box A. Explain the work.

c. Box B shows how to add with decimal fractions. As with whole numbers, begin to add at the right:

Tenths: 7 + 6 = 13. Since 10 tenths = 1 whole, then 13 tenths = 1 one and 3 tenths. Write "3" in tenth's place and carry the 1 to one's column. Put the decimal point in the sum to separate the decimal fraction from the whole number.

Ones: 1 (carried) + 1 + 2 = 4. Write "4" in one's place.

Tens: Write "7" in ten's place.

d. Which way is easier, using common or decimal fractions?

2. When Jim got home, the cyclometer on his bicycle read 85.2 miles. From the time he left City Park, when the cyclometer registered 72.6 miles, how far had Jim's bicycle gone?

C Using Common Fractions

$$\begin{array}{rcl} 85\frac{2}{10} & = & 84\frac{12}{10} \\ -72\frac{6}{10} & = & 72\frac{6}{10} \\ \hline & & 12\frac{6}{10} = 12\frac{3}{5} \end{array}$$

D Using Decimals

$$\begin{array}{r} 8\overset{4}{\cancel{5}}.\overset{(12)}{\cancel{2}} \\ -72.6 \\ \hline 12.6 \end{array}$$

a. To subtract with common fractions (box C), why must we first change $85\frac{2}{10}$ to $84\frac{12}{10}$? Explain the work in box C.

b. In box D, we subtract with decimals.

Tenths: We cannot subtract 6 from 2, so we borrow 1 one, change it to 10 tenths, and add 10 tenths to the 2 tenths to make 12 tenths. 12 − 6 = ? We put a decimal point in the remainder to separate the decimal fraction from the whole number.

Ones: 4 − 2 = ? Tens: 8 − 7 = ?

c. Which way of subtracting seems easier, with common fractions or with decimals?

3. Explain how carrying and borrowing with decimals is like carrying and borrowing with whole numbers.

[W]

4. Add or subtract. Check a–e by using common fractions. Check f–o just as you check A. and S. with whole numbers.

a. 4.6 + 25.4
b. 19.7 − 2.5
c. 28.5 − 0.7
d. 8.5 + 72.8
e. 0.3 + 7.9
f. 46.0 − 28.4
g. 75.2 − 74.6
h. 28.7 + 93.2
i. 16.4 + 0.7
j. 42.6 + 17.8
k. 496.5 + 175.6
l. 195.9 − 83.9
m. 241.3 + 297.0
n. 578.2 − 48.7
o. 385.4 + 963.5

Extra Practice. For more practice, work Set 92.

Decimals Go to a Beach Picnic

A. and S. of tenths [W]

Add or subtract in these problems, using decimals. Check by using common fractions.

1. When the Fraser family went to the beach for an all-day picnic, they drove 4.9 miles to the store and then 8.7 miles farther to the beach. How far did they drive in all?

2. In getting ready for the picnic Sally filled the two salt shakers from a new 1-pound box of salt. One of the shakers held 1.5 ounces and the other held 0.5 ounce. How much salt was left in the box?

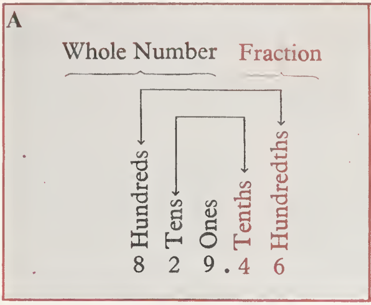
3. For sandwich filling, Mrs. Fraser used a 7.5-ounce can of tuna fish and a 2.5-ounce can of chopped olives. How many ounces of tuna fish and olives did she use in all?

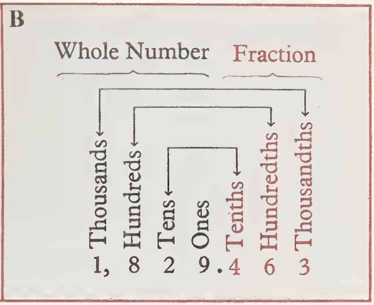
4. Paul and Ed asked their father to take his stop watch so he could time their swimming races. Paul swam to Rocky Point in 8.6 seconds. Ed's time was 9.3 seconds. Paul's time was how much less than Ed's?

5. On the way home the Frasers drove 5.3 miles to the post office and then 7.8 miles home from there. Was the return trip longer or shorter than the trip to the beach (Ex. 1)? How much longer or shorter?

Smaller Decimals

Meaning of hundredth; thousandth [O]





1. In box A, $829\frac{46}{100}$ is written as a mixed decimal. What is the name of the place farthest right in this number?

2. In box B, $1{,}829\frac{463}{1{,}000}$ is written as a mixed decimal. What is the name of the place farthest right in this number?

3. In our decimal number system, one's place is the center. Then, in relation to one's place, what is true of ten's place and tenth's place? of hundred's place and hundredth's place? of thousand's place and thousandth's place?

4. In writing $829\frac{6}{100}$ as a decimal, what must we do to keep the 6 in hundredth's place?

5. How would we write $1{,}829\frac{3}{1{,}000}$ as a decimal? $1{,}829\frac{63}{1{,}000}$?

6. Read from box C some meanings of the number 829.46

C

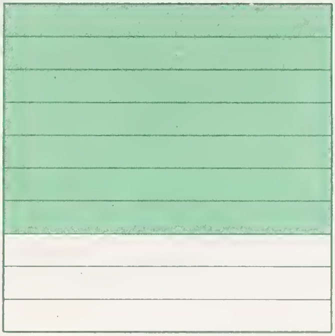
The number 829.46 means

8 hundreds and 2 _?_ and 9 _?_ and 4 _?_ and 6 _?_,
or 82 tens and 9 _?_ and 4 _?_ and 6 _?_,
or 829 ones and 4 _?_ and 6 _?_,
or 8,294 tenths and 6 _?_,
or 82,946 hundredths,
or 829 and 46 _?_.

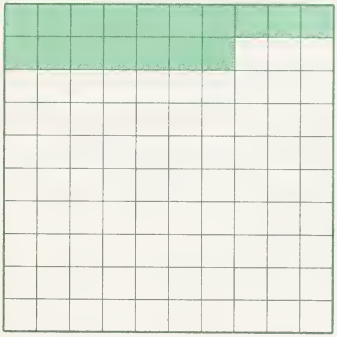
7. Tell the meaning of 653.709 in as many ways as you can.

Smaller Decimal Fractions

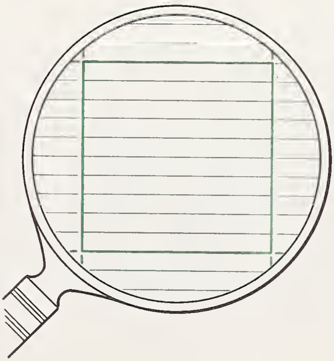
A



B



C



Meaning of hundredths; thousandths [O]

1. Square A is divided into _?_ equal parts, so 1 of the equal parts is $\frac{1}{?}$, or 0.1, of the square.

2. In square A, 7 of the 10 equal parts are colored, so $\frac{?}{?}$, or 0.7, is colored.

3. Square B is divided into _?_ equal parts. One of the equal parts is $\frac{1}{?}$, or 0.01, of the whole square.

4. How many of the equal parts of square B are colored? Then $\frac{?}{100}$, or 0.17, of the square is colored.

5. If we divided each small square in B into 10 equal parts, as shown by the magnified section in C, how many of these smaller parts would there be in all of square B? Then each very small part would be $\frac{1}{?}$ of square B, or 0.001. 175 of these smaller parts would be $\frac{?}{1{,}000}$ of square B or, as a decimal, 0.175 of square B.

[W]

6. Write as decimals:

a. $\frac{75}{100}$ **b.** $\frac{295}{1{,}000}$ **c.** $\frac{4}{100}$

d. $\frac{68}{1{,}000}$ **e.** $\frac{3}{1{,}000}$ **f.** $\frac{90}{100}$

A. and S. of Hundredths and Thousandths

[O]

1. In one part of the country the rainfall was 4.97 in. for June, 3.64 in. for July, and 2.86 in. for August. Find the total for the three months.

The sum of the hundredth's column is 17 hundredths, or _?_ tenth and _?_ hundredths. We write _?_ in hundredth's column and carry 1 _?_.

The sum of the tenth's column is 24 tenths, or _?_ ones and _?_ tenths. What is carried?

The sum of the one's column is _?_.

2. One year the July rainfall was 4.13 in. This was how much more than the 3.64 in. in Ex. 1?

Explain the subtraction in box B. How can you check the remainder?

3. Mr. Jay's building lot contains 0.329 acre, and Mr. Todd's lot contains 0.404 acre. Which lot is larger? How much larger?

Explain the work in box C.

4. Both lots in Ex. 3 contain how much land? Explain the addition in box D.

A

$$\begin{array}{r} {\scriptstyle 2\ 1} \\ 4.97 \\ 3.64 \\ +2.86 \\ \hline 11.47 \end{array}$$

B

$$\begin{array}{r} {\scriptstyle 3\ \textcircled{10}\textcircled{13}} \\ \cancel{4}.\cancel{1}\cancel{3} \\ -3.64 \\ \hline 0.49 \end{array}$$

C

$$\begin{array}{r} {\scriptstyle 3\ 9\ \textcircled{14}} \\ 0.\cancel{4}\cancel{0}\cancel{4} \\ -0.329 \\ \hline 0.075 \end{array}$$

D

$$\begin{array}{r} {\scriptstyle 1} \\ 0.404 \\ +0.329 \\ \hline 0.733 \end{array}$$

[W]

Add or subtract in rows 5–7. Check your answers.

	a	b	c	d	e
5.	0.37 +0.86	1.95 +2.56	\$2.05 −1.36	8.304 −2.647	4.526 −0.877
6.	7.00 −2.93	5.28 −2.09	\$2.35 +2.35	7.265 −0.528	6.382 −1.876
7.	1.26 0.86 +7.42	4.51 3.09 +0.97	\$9.64 7.38 +0.07	6.397 0.496 +0.587	2.876 1.359 +0.676

➤ **Extra Practice.** For more practice, work Sets 91 and 93.

When Decimals Are Not Like-Fractions

A. and S. [O]

1. On page 224, 0.7 of square A is colored. If you made three copies of a square the size of A and colored 0.7 of one, 0.70 of another, and 0.700 of another, why would the same amount be colored in each square? Then 0.7 and 0.70 and 0.700 are all equivalent and we call them **exact decimals.**

2. Now suppose you found that a line was 0.7 in. long when you measured it with a ruler divided into tenths of an inch. Would you be likely to get *exactly* the same result if you measured it with a ruler divided into hundredths of an inch and then with one divided into thousandths? **Measurement decimals,** like other measurement numbers, are never exact.

The decimals in the boxes below are exact. Give the equivalents in each row.

	Tenths		Hundredths		Thousandths
3.	0.2	=	0.20	=	0.200
4.	_?_	=	0.50	=	_?_
5.	0.8	=	_?_	=	_?_

	Tenths		Hundredths		Thousandths
6.	0.9	=	_?_	=	_?_
7.	_?_	=	0.10	=	_?_
8.	_?_	=	_?_	=	0.400

9. In the box below, do the exact decimals in the column at the left have the same fractional unit?

Before we can add or subtract decimal fractions whose fractional units are not the same, we must change them so they will have the same fractional unit.

Explain what is done in the box. Why don't we change all the fractions to tenths?

0.3	=	0.300
0.45	=	0.450
0.785	=	0.785
+0.82	=	0.820
		2.355

[W]

Add or subtract these exact decimals:

10. 0.8 + 0.35 + 0.7

11. 6.75 + 9.825 + 0.1

12. 1.6 − 0.87

13. 4.8 − 1.275

14. 0.909 + 9.9

15. 5.075 − 4.26

Comparing Exact Decimals

[O]

After a discussion about comparing some exact decimals, Miss Pike's class agreed on these things:

a. If two decimal fractions have a common denominator (as 10 or 100 or 1,000), you can quickly tell which fraction is larger.

Why do you know that 0.8 is more than 0.4?

b. Decimal fractions whose fractional units are unlike can be made to have a common denominator and can then be compared.

Explain why 0.6 is more than 0.58 (0.6 = 0.60)

Explain why 0.48 is more than 0.474

c. Any mixed decimal is more than any decimal fraction. Why is 1.01 more than 0.999?

d. If two mixed decimals have different whole numbers, the one with the larger whole number is greater.

Why is 4.01 more than 3.99? Why is 5.798 less than 6.001?

e. In any two decimal fractions, if the tenth's figure of one is larger than the tenth's figure of the other, the fraction with the larger number of tenths is the larger fraction.

Explain why 0.42 is larger than 0.259

[W]

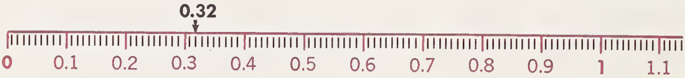
In each case which of these exact decimals is larger:

1. 0.83 or 0.73?
2. 2.18 or 3.01?
3. 0.52 or 0.5?
4. 0.61 or 0.061?
5. 1.2 or 0.87?
6. 0.7 or 0.75?
7. 0.894 or 1.02?
8. 0.06 or 0.17?
9. 2.1 or 0.210?

Copy the smallest number in each of these groups:

10. 2.9 2.41 2.995
11. 0.60 0.7 0.601
12. 0.7 0.701 0.699
13. 56.2 57.94 58.603
14. 0.57 5.70 0.057
15. 1.95 2.05 1.85
16. 0.4 0.38 0.426
17. 0.15 0.2 0.104

Rounding Exact Decimals



You rounded common fractions on page 122. You can round decimal fractions in a similar way.

1. Study the number line above, which shows lines marking off tenths and hundredths. What color are the marks which show tenths? What color shows hundredths?

2. Put the thumb of your right hand on 0 and a finger of that hand on 1. Between those two points show the following:

a. 0.3 **b.** 0.7 **c.** 0.2 **d.** 0.1 **e.** 0.5 **f.** 0.4

3. Is each of these nearer to 0 or to 1?

a. 0.2 **b.** 0.7 **c.** 0.9 **d.** 0.3 **e.** 0.8 **f.** 0.6

4. Now tell whether to round the tenths in Ex. 3 to 0 or to 1.

5. See if you can round each of these mixed decimals to the nearest whole number:

a. 5.2 **b.** 8.7 **c.** 4.9 **d.** 7.3 **e.** 3.5 (round 5 upward)

6. Again look at the number line and count the hundredths between 0 and 0.1; between 0.1 and 0.2; between 0.6 and 0.7

7. With your finger on tenth marks, count hundredths 10 at a time: 10 hundredths, 20 hundredths, and so on.

8. Notice the arrow pointing to 32 hundredths (0.32). Is 0.32 nearer to 3 tenths (0.3) or to 4 tenths (0.4)? To the nearest tenth, would you round 0.32 hundredths to 0.3 or to 0.4?

9. Round to the nearest tenth: **a.** 0.86; **b.** 1.04; **c.** 0.89; **d.** 5.32; **e.** 7.05; **f.** 9.13

10. Use what you have learned about tenths and round to the nearest hundredth: **a.** 0.479; **b.** 6.521; **c.** 2.899

Comparing Measurement Numbers

A. and S. [O]

1. Mr. Rand was planning to buy a building lot. He looked up the records on two lots that were for sale and found that one was listed as 105.28 ft. across the front and the other as 86.7 ft. The first lot was how much wider than the second?

Why can't we compare the widths by subtracting 86.7 from 105.28? What is the fractional unit for the .28? for the .7?

In this problem we are working with measurement numbers. We cannot change them as we change exact decimals. If we changed 86.7 to 86.70, we would be saying that the measurement was made more accurately than it really was—to hundredths of a foot instead of to tenths of a foot. When we want to add or subtract measurement decimals, we must first find the decimal with the *largest* fractional unit. Then we must change the others so they will have the same fractional unit as this one does—that is, we must round them.

For 105.28 and 86.7, which decimal has the larger fractional unit?

The box shows how these mixed decimals were changed to get them ready for subtraction. Explain the work.

$$\begin{array}{r} 105.28 \\ -86.7 \\ \hline \end{array} \quad = \quad \begin{array}{r} 105.3 \\ -86.7 \\ \hline 18.6 \end{array}$$

Tell how to change the following measurement numbers before adding or subtracting. Do any not need to be changed?

	a	b	c
2.	4.8 in. + 6.82 in.	8.7 in. − 3.25 in.	0.375 oz. − 0.75 oz.
3.	76.89 mi. + 5.7 mi.	5.625 in. + 9.5 in.	17.75 mi. − 4.008 mi.
4.	125.6 lb. + 85.2 lb.	9.25 ft. − 4.5 ft.	18.8 ft. − 7.25 ft.
5.	5.95 yd. + 4.8 yd.	64.5 ft. + 3.005 ft.	10.875 lb. + 2.75 lb.

[W]

Now write the work for rows 2–5, as in the box.

Using Decimals in a Hospital

A. and S. problems with decimals [W]

Ruth's sister, Jo-Anne, is a student nurse. She told Ruth that nurses have to use decimals in many ways. Here are some of her problems. See if you can solve them.

1. When the patient's temperature is 101.8°, how many degrees above the normal body temperature of 98.6° is it?

2. To make a narrow bandage, Jo-Anne cut a strip of muslin 1.5 inches wide from a piece of muslin 6.2 inches wide. How wide was the piece left?

3. For dinner, one patient ate 13.5 ounces of meat soup, 5.8 ounces of beefsteak, 1.2 ounces of mashed potato, and a 1.0-ounce roll. How many ounces of food did the patient eat?

4. One of Jo-Anne's textbooks gave the following table about vitamin C and fruit juices.

Fruit Juice Needed for One Day's Supply of Vitamin C

Juice	Orange	Grapefruit	Pineapple	Tomato
Cups	0.375	0.375	1.750	0.875

a. How much less orange juice than pineapple is needed for 1 day's supply of vitamin C?

b. How much more tomato juice than grapefruit is needed?

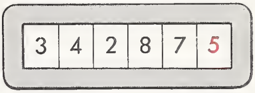
c. Which juice provides the least vitamin C?

5. Medicine is sometimes weighed in *grams*. A 0.016-gram tablet weighs how much less than a 0.324-gram tablet?

Decimal and Common-Fraction Equivalents

[O]

1. The diagram at the right below shows what Paul saw when he looked at the mileage meter on his father's car one morning. The red 5 means 5 tenths. If Paul reads the mileage correctly, what will he say?



Box A shows three ways to write the fraction of a mile. Read all three.

Why could Paul change 0.5 to $\frac{5}{10}$ and then to $\frac{1}{2}$?

A

$0.5 = \frac{5}{10} = \frac{1}{2}$

B

$0.8 = \frac{8}{10} = \frac{4}{5}$

C

$$0.625 = \frac{625}{1{,}000}$$

$$\frac{625 \div 125}{1{,}000 \div 125} = \frac{5}{8}$$

2. The meter showed 34295 8 when Paul's father stopped for gas. Read this number.

Box B shows the steps in changing 0.8 to a common fraction in best form. Explain each step.

3. The baseball report shows that the Sox have won 0.625 of their games. This is what common fraction of their games? Explain box C.

4. \$0.75 is what fraction of a dollar? $\frac{75}{100} = \frac{75 \div 25}{100 \div 25} = \frac{?}{?}$

[W]

Change to common fractions in lowest terms.

5. 0.2 6. 0.6 7. 0.25 8. 0.05 9. 0.125

10. 0.35 11. 0.375 12. 0.55 13. 0.4 14. 0.875

15. Copy and finish this table. Then see if you know each decimal and its equivalent common fraction in lowest terms.

$0.5 = \frac{5}{10} = \frac{1}{2}$

$0.25 = \frac{?}{100} = \frac{?}{?}$

$0.75 = \frac{?}{100} = \frac{?}{?}$

$0.2 = \frac{?}{?} = \frac{?}{?}$

$0.4 = \frac{?}{?} = \frac{?}{?}$

$0.6 = \frac{?}{?} = \frac{?}{?}$

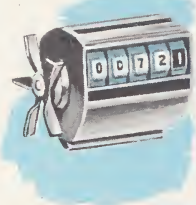
$0.8 = \frac{?}{?} = \frac{?}{?}$

$0.125 = \frac{125}{1{,}000} = \frac{1}{8}$

$0.375 = \frac{?}{1{,}000} = \frac{?}{?}$

$0.625 = \frac{?}{1{,}000} = \frac{?}{?}$

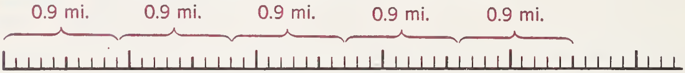
$0.875 = \frac{?}{1{,}000} = \frac{?}{?}$



Multiplying a Decimal

M. of tenths by whole number [O]

1. Gail's cyclometer shows that she rides 0.9 mi. each day in making the round trip to and from school. Gail wants to know how many miles she rides in her 5 round trips a week.



Count on the number line: 9 tenths, 18 tenths, _?_, _?_, _?_. 45 tenths = _?_ ones and _?_ tenths, or 4.5

Gail added the five 0.9's, as in box A. Read the sum as tenths; then as ones and tenths.

The numbers to be added are equal, so Gail could multiply, as in box B. If Gail multiplies tenths, her product must be tenths. Is it? Explain.

A	B
0.9 0.9 0.9 0.9 +0.9 4.5	0.9 ×5 4.5

[W]

Add to find n in Ex. 2–7.

2. 6 × 0.2 = n
3. 4 × 0.3 = n
4. 2 × 0.8 = n
5. 7 × 0.5 = n
6. 8 × 0.7 = n
7. 4 × 0.4 = n

Beside each addition write the multiplication, as in box B.

8. In 6 round trips of 1.8 mi. to the store and back, how far will Gail ride?

Box C. Tenths: *Think*, "6 × 8 = 48. 48 tenths equal 4 ones and 8 tenths." Write "8" in tenth's place in the product and carry the 4 ones. Put the decimal point in the product to separate the decimal fraction from the whole number.

Ones: *Think*, "6 × 1 = 6, and the 4 ones carried make 10 in all." Write "10" at the left of the decimal point.

C

$$\begin{array}{r} 1.8 \\ \times 6 \\ \hline 10.8 \end{array}$$

When you multiply you are finding the total, so when you multiply tenths by a whole number (6 × 8 tenths), must you have tenths in the product? Which place at the right of one's place shows tenths?

9. Write the addition to show that $6 \times 1\frac{8}{10} = 10.8$

[W]

Copy and multiply. Make sure that your products show tenths. Check the answers in row 10 by addition.

	a	b	c	d	e	f	g
10.	0.3 ×2	0.8 ×4	0.6 ×7	0.9 ×4	0.5 ×3	0.7 ×5	0.4 ×2
11.	1.7 ×3	2.7 ×8	6.3 ×5	4.6 ×8	5.2 ×9	3.4 ×6	8.9 ×7
12.	0.9 ×5	6.8 ×3	0.4 ×6	3.7 ×2	0.3 ×8	5.6 ×7	0.6 ×4

13. Does 3 × 0.4 = 12 or 1.2 or 0.012?

14. Does 2 × 6.8 = 136 or 1.36 or 13.6?

15. Does 4 × 28.4 = 11.36 or 113.6 or 1136?

When a number with the fractional unit tenths is multiplied by a whole number, the product must show tenths.

Multiplying Hundredths and Thousandths

Multiplier a whole number [O]

1. For joining two pipes, Mr. Best, the plumber, uses an iron elbow listed as weighing 0.92 lb. He carried 4 of these elbows in his box of tools. How much did these 4 elbows weigh?

Rounded to the nearest whole number, 0.92 is nearly 1. Will the product of 4×0.92 be about 0.4 or about 4 or about 40? Explain.

In box A, when 2 hundredths are multiplied by 4, the product is 8 _?_. In which column is the 8 written? Explain all the multiplying.

A

$$\begin{array}{r} 0.92 \\ \times 4 \\ \hline 3.68 \end{array}$$

When a decimal with hundredths as the fractional unit is multiplied by a whole number, the fractional unit in the product is _?_. How do you show this?

2. Another piece of pipe was listed as weighing 0.798 lb. How much would 6 of these pieces weigh?

When thousandths (box B) are multiplied by a whole number, the product shows _?_.

How many places to the right of one's place are used to show thousandths? Explain box B.

B

$$\begin{array}{r} 0.798 \\ \times 6 \\ \hline 4.788 \end{array}$$

[W]

Copy and multiply the following:

	a	b	c	d	e	f
3.	0.13 ×4	0.47 ×5	0.254 ×3	0.73 ×6	0.462 ×7	4.9 ×6
4.	0.04 ×6	0.28 ×3	0.795 ×5	0.592 ×7	0.93 ×5	3.19 ×4
5.	0.37 ×2	0.69 ×8	0.686 ×4	0.284 ×8	0.086 ×6	5.621 ×3

When a decimal is multiplied by a whole number, the product must show the same fractional unit, and so the same decimal places, as the decimal factor.

[O]

C

6.15
×6
36.90,
or 36.9

D

1.24
×13
3 72
12 4
16.12

E

0.912
×25
4 560
18 24
22.800

6. Study the work in box C.

What fractional unit has the multiplicand? the product, 36.90?

Why can the decimal fraction .90 be reduced to .9? Is the product in best form when we write it as 36.9?

7. Study the work in box D. How is this multiplication different from that in box C?

Do we use decimal points in the partial products? Explain the work.

What fractional unit do both the multiplicand and the product have?

8. In box E, why do we have three decimal places in the product? To what can we reduce the decimal fraction in the product?

[W]

Multiply. Be sure that each product has the correct fractional unit. Reduce decimal fractions in the products when you can.

	a	b	c	d	e	f
9.	0.8 ×5	0.3 ×24	4.23 ×8	0.4 ×15	27.3 ×20	5.36 ×18
10.	3.62 ×21	0.05 ×26	8.46 ×10	3.28 ×21	2.87 ×92	0.463 ×7
11.	8.3 ×26	27.6 ×20	96.7 ×54	3.62 ×56	7.286 ×5	8.039 ×42
12.	8.19 ×56	34.15 ×18	62.8 ×62	0.803 ×14	5.724 ×63	2.145 ×24

Extra Practice. For more practice, work Set 94.

Problems with Decimal Fractions

[W]

Write your work for these problems. Sometimes you will need to use numbers from other problems.

1. Mr. Griggs rides to work on the train a distance of 6.8 mi. In the 10 trips he makes during a week, how many miles does he ride?

2. A freight train averaged 11.5 mi. an hour for 12 hr. How many miles did it go in that length of time?

3. A passenger train averaged 45.875 mi. per hour during a 12-hour trip. How many miles did it travel in the 12 hr.?

4. Use your answers from Ex. 2 and 3 to find how much farther the passenger train went than the freight train in the same length of time.

5. One car in a 70-car train of coal cars held 56.25 T. of coal. How much coal could this whole train carry if each car were filled with the same amount?

6. On the same railroad, the Marmion averaged 41.68 mi. per hour, and the Oglethorpe averaged 43.75 mi. per hour. How much farther can the Oglethorpe go in 12 hr. than the Marmion?

When the Multiplier is 10 or 100 or 1,000

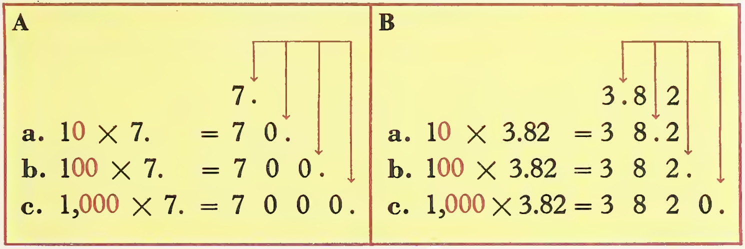
Multiplying a decimal [O]

1. As you study the work in box A, remember that any whole number can be written with a decimal point after it.

a. When 7. is multiplied by 10, you can think of the decimal point as moved 1 place to the right to make the product 70. Then 7 has been given 1 place-holder zero at its right.

b. When 7. is multiplied by 100, you can think of the decimal point as moved 2 places to the right to make the product 700. Then 7 has been given how many place-holder zeros at its right?

c. Tell what happens when 7. is multiplied by 1,000



A

7.

a. 10 × 7. = 70.

b. 100 × 7. = 700.

c. 1,000 × 7. = 7000.

B

3.82

a. 10 × 3.82 = 38.2

b. 100 × 3.82 = 382.

c. 1,000 × 3.82 = 3820.

2. In box B explain what happens to the decimal point
a. in 10 × 3.82; **b.** in 100 × 3.82; **c.** in 1,000 × 3.82

To find the product when the multiplier is 10 or 100 or 1,000, think of the decimal point as moved to the right as many places as there are 0's in the multiplier.

3. Multiply each of these numbers by 10:
5.8 0.725 2.409 0.7 0.009 452 7.36

4. Multiply each of these numbers by 100:
7.16 3.2 0.95 0.04 0.8 736 5.04

5. Multiply each of these numbers by 1,000:
9.08 3.4 2.76 15.45 9.087 29.3 30.75

[W]

▶ **Extra Practice.** For more practice, work Set 95.

Multiplying a Whole Number by a Decimal

[O]

1. At Lee's Filling Station, Jim got 0.7 gal. of gasoline for his motor scooter. The scooter goes 51 miles on 1 gallon of gasoline. How far will it go on 0.7 gal.?

If you use $\frac{7}{10}$ for 0.7, you know that on $\frac{7}{10}$ of a gallon, it will go $\frac{7}{10}$ of 51 mi., or $\frac{7}{10} \times 51$ mi. You think the same way to find 0.7 of 51 mi. In box A at the right, when 0.7×1 is found, why will the 7 in the product be 7 tenths?

In box B, explain all the multiplying.

When a whole number is multiplied by tenths, the product shows _?_. We put a decimal point in the product to show this.

A

$$\begin{array}{r} 51 \\ \times 0.7 \\ \hline 7 \end{array}$$

B

$$\begin{array}{r} 51 \\ \times 0.7 \\ \hline 35.7 \end{array}$$

[W]

Copy and multiply.

	a	b	c	d	e
2.	32 ×0.4	85 ×0.2	49 ×0.8	67 ×0.5	75 ×0.6
3.	45 ×2.4	73 ×4.5	86 ×5.3	39 ×6.2	24 ×7.6
4.	128 ×0.5	364 ×0.9	432 ×0.7	875 ×0.4	643 ×0.6

5. At 41 mi. an hour, how far will a train go in 0.35 hr.? 0.35 × 41 = ?

In box C we have multiplied by the 5 hundredths in 0.35, so the 5 in the first partial product is in hundredth's place. We do not put points in partial products. Explain this multiplying.

C
41
×0.35
2 05

In box D, for the second partial product, we have multiplied by the 3 tenths in 0.35, so the 3 in this partial product will be in _?_ place. Do we use the decimal point in the partial product?

Read the final product in box D. When any whole number is multiplied by hundredths, the product shows _?_.

D
41
×0.35
2 05
12 3
14.35

6. 0.875 × 286 = ? Study the work in box E.

Why is the first partial product thousandths? the second, hundredths? the third, tenths? Why does the final product show 3 places at the right of one's place? In best form, the answer is _?_.

E
286
×0.875
1 430
20 02
228 8
250.250

[W]

Copy, and place decimal points correctly in the products.

	a	b	c
7.	1.82×237=43134	0.6×138=828	0.407×184=74888
8.	2.06×247=50882	0.02×54=108	0.843×17=14331

Copy and multiply.

9.	0.72 × 431	0.35 × 293	2.25 × 475
10.	0.875 × 424	0.375 × 856	0.625 × 784
11.	0.25 × 84	0.125 × 648	5.75 × 824

Extra Practice. For more practice, work Set 96.

When a whole number is multiplied by a decimal, the product has the same number of places at the right of one's place as the decimal factor has.

Reversing Factors

Mixed decimal × whole number [O]

1. With the factors 18 and 2.314, would it be easier to multiply as in box A or as in box B? Why?

2. In box B, when the factors are reversed we get different partial products. Does this change the final product?

3. For rows 4–8 below, tell which examples will be easier to do if the factors are reversed. Then tell how many decimal places each product should show.

A	B
18	2.314
×2.314	×18
72	18 512
18	23 14
5 4	41.652
36	
41.652	

When factors are reversed, the final product is not changed.

When one of two factors is a decimal, the product shows the same number of places at the right of one's place as this decimal factor does.

[W]

Copy and multiply. Reverse factors when you want to.

	a	b	c	d	e
4.	27 ×0.9	34 ×8.3	20 ×0.4	1.6 ×3	47 ×0.046
5.	0.02 ×36	89 ×0.6	0.8 ×7	3.9 ×6	5 ×2.59
6.	42 ×2.6	8.3 ×25	74 ×6.2	37 ×3.21	214 ×0.076
7.	863 ×0.52	12 ×0.062	65 ×0.146	43 ×2.07	75 ×2.456
8.	53 ×0.03	400 ×0.8	42 ×1.426	0.005 ×47	124 ×3.582

Just to Remind You!

[O]

1. Read these numbers: 4,166,285; 16.01; 43.865; 6.720; 1,500,000,000; 0.004; $\frac{5}{8}$ mi.; $9\frac{3}{4}$ T.; 6.4

2. Add mentally: **a.** 43 + 18 (*think*, "43, 53, 61"); **b.** 35 + 17; **c.** 56 + 22; **d.** 45 + 36; **e.** 18 + 56; **f.** 25 + 37.

3. Change to best form: $\frac{16}{5}$; $\frac{14}{4}$; $\frac{16}{8}$; $\frac{20}{14}$.

4. Round to tenths: 7.62; 4.027; 61.66; 9.97

5. Tell the meaning or illustrate: **a.** picture graph; **b.** fractional unit; **c.** number line; **d.** factor; **e.** reference measure.

6. What reference measure would be useful in estimating the height of a tall plant?

7. Tell the products of: **a.** 100 × 684; **b.** 1,000 × 84.2; **c.** 7.03 × 100; **d.** 10 × 0.05; **e.** 1.06 × 1,000; **f.** 10 × 1.5

8. Tell how to find n in

a. $6.5 + n = 11.4$; **b.** $17.5 - n = 8.3$; **c.** $n + 2.25 = 6.75$

9. How many zeros will there be in the denominator of the common fraction equivalent to 0.7? to 0.39? to 0.423?

Keeping Up Your Skill

[W]

Copy and work Ex. 1–19.

1.
$$\begin{array}{r} 489 \\ 340 \\ 658 \\ 35 \\ +106 \\ \hline \end{array}$$

2.
$$\begin{array}{r} 1.95 \\ 8.26 \\ 1.08 \\ 3.67 \\ +0.35 \\ \hline \end{array}$$

3.
$$\begin{array}{r} 80.6 \\ 2.9 \\ 31.4 \\ 7.2 \\ +53.6 \\ \hline \end{array}$$

4.
$$\begin{array}{r} 781 \\ -93 \\ \hline \end{array}$$

5.
$$\begin{array}{r} 8{,}000 \\ -5{,}928 \\ \hline \end{array}$$

6.
$$\begin{array}{r} 35 \\ -2.86 \\ \hline \end{array}$$

7.
$$\begin{array}{r} 49.3 \\ -18.5 \\ \hline \end{array}$$

8. 34 × 87 **9.** 26 × 3.5 **10.** 0.04 × 96 **11.** $81\overline{)29{,}634}$

12. $2\frac{3}{4} \div \frac{1}{2}$ **13.** $\frac{4}{5} \div \frac{2}{3}$ **14.** $4\frac{2}{3} \times 1\frac{3}{8}$ **15.** $\frac{2}{5} \times 7\frac{1}{2}$

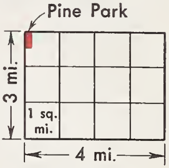
16. $8\frac{1}{3} + 16\frac{3}{4}$ **17.** $5\frac{3}{8} + \frac{7}{12}$ **18.** $6 - 3\frac{1}{8}$ **19.** $4\frac{1}{6} - 2\frac{3}{4}$

Multiplying One Decimal Fraction by Another

Meaning; tenths × tenths [O]

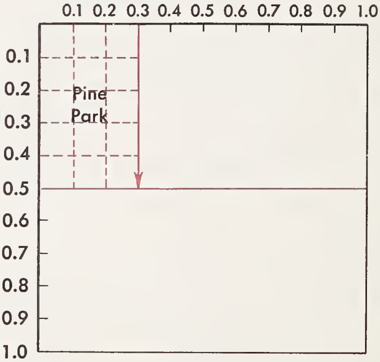
1. Bob's town is 4 mi. long and 3 mi. wide. In school one day he found the area by multiplying 3 × 4 sq. mi. = _?_ sq. mi.

Explain from the drawing why he worked this way.



2. Bob wanted to find the area of Pine Park. The speedometer on his father's car showed that the park was 0.3 mi. wide and 0.5 mi. long. Bob knew that he probably should multiply 0.5 sq. mi. by 0.3. He *thought* "3 × 5 = 15," but he didn't know what to do next.

Here are some ways Bob could have found the answer:



a. This square shows an enlarged diagram of 1 square mile in Bob's town. The heavy line from left to right marks off _?_ of the square mile. A line drawn down from 0.3 (see arrow) marks off 0.3 of the 0.5 sq. mi.

The diagram showed Bob that the park was smaller than the 0.5 sq. mi., so he decided that the 15 he got by multiplying 3 × 5 must be 0.15 sq. mi. Explain why 0.15 is smaller than 0.5.

b. To check his work, Bob used common fractions this way: $\frac{3}{10} \times \frac{5}{10} = \frac{15}{100}$. Was Bob's 0.15 sq. mi. the correct answer?

c. In b above, multiplying tenths times tenths gives hundredths. So for 0.3 × 0.5, the answer is _?_.

d. From the box tell an easy way to find the number of decimal places in the product.

1 place 1 place 2 places
0.5 × 0.3 = 0.15

3. Boxes A and B show two steps in multiplying 0.3×0.5 when written in vertical form.

Box A shows that for the first step we *think* "$3 \times 5 = ?$" instead of "$0.3 \times 0.5 = ?$"

In box B, we can *think* "tenths × tenths = hundredths," so the product must show hundredths. But we usually use the quicker way of noticing that each of the factors (0.5 and 0.3) has 1 decimal place, so the product must show 2 decimal places.

A

$$\begin{array}{r} 0.5 \\ \times 0.3 \\ \hline 15 \end{array}$$

B

$$\begin{array}{r} 0.5 \\ \times 0.3 \\ \hline 0.15 \end{array}$$

The product 0.15 is less than the multiplicand 0.5. Why should this be? How does the 0 in 0.15 help to show that the product has no whole number?

4. $0.2 \times 0.4 = ?$ Study the work in box C. How many decimal places must there be in the product? In box C, how do we show the 2 places where the product of 2×4 is a 1-place number?

C

$$\begin{array}{r} 0.4 \\ \times 0.2 \\ \hline 0.08 \end{array}$$

5. For each example in row 6 below, tell how many decimal places the product should have.

[W]

Copy and multiply in rows 6–8. Check each product to be sure it has the correct number of decimal places.

	a	b	c	d	e	f
6.	0.3 ×0.4	0.7 ×0.2	0.8 ×0.2	0.4 ×0.5	0.6 ×0.9	0.2 ×0.5
7.	0.4 ×0.6	0.8 ×0.5	0.6 ×0.3	0.6 ×0.2	0.3 ×0.7	0.2 ×0.9
8.	0.9 ×0.8	0.3 ×0.3	0.9 ×0.7	0.5 ×0.6	0.2 ×0.4	0.7 ×0.8

When two decimals are multiplied, the product has as many places at the right of one's place as there are decimal places in both factors together.

Multiplying Two Mixed Decimals

Estimating product [O]

A

$$\begin{array}{r} 14.3 \\ \times 8.6 \\ \hline 858 \\ 1144 \\ \hline 122.98 \end{array}$$

B

Rounding:

$$\begin{array}{r} 14 \\ \times 9 \\ \hline 126 \end{array}$$

1. Mr. Lee's car averages 14.3 mi. per gallon of gasoline. At that rate, how far will it go on 8.6 gal.?

Explain all the work in box A. Does the product have as many decimal places as there are in the two factors together?

You can test the product to see if it is sensible. You round the factors to the nearest whole numbers and multiply, as in box B. From the product 126, how would you know where to put the decimal point in 12298 (box A)?

2. A kilometer is a unit of length used in many countries. A mile is 1.61 kilometers, so 3.8 miles are equal to how many kilometers? 3.8 × 1.61 = ?
38 × 161 = 6118. Does 3.8 × 1.61 = 6.118 or 61.18?
Show on the board that your answer is sensible.

[W]

In rows 3 to 6, first estimate the products by rounding the numbers and multiplying. Then copy each example, multiply, and check the number of decimal places in the product.

	a	b	c	d	e
3.	4.87 ×2.4	3.45 ×2.8	7.34 ×1.6	9.2 ×1.3	6.7 ×2.9
4.	5.3 ×7.1	2.9 ×3.54	4.12 ×1.6	4.914 ×9	28.7 ×7.6
5.	16.2 ×5.5	3.7 ×1.42	7.42 ×9.3	4.2 ×7.57	38.1 ×2.2
6.	5.43 ×3.7	3.61 ×2.8	21.6 ×3.9	8.275 ×8	12.7 ×4.6

➤ **Extra Practice.** For more practice, work Sets 97–99.

Is Your Product Sensible?

[O]

Each of the five problems below calls for the product of two decimals. The product figures are shown. Read each product with its decimal point correctly placed. Then tell why you think your answer is sensible.

1. The cruising speed of an airplane is 3.5 mi. a minute. How many miles will it fly in 1.8 min.? 630 mi.

2. A family buys, on the average, 12.5 qt. of milk a week. At $2.75 a week, how much was a month's milk bill? $34375

3. A ranch 2.6 mi. long and 1.7 mi. wide contains how many square miles? 442 sq. mi.

4. A bag that now costs $5.65 used to cost 1.8 of that amount. What was its former cost? $10170

5. Tom's dog weighs 24.75 lb. Tom himself weighs 3.8 times as much. How much does Tom weigh? 94050 lb.

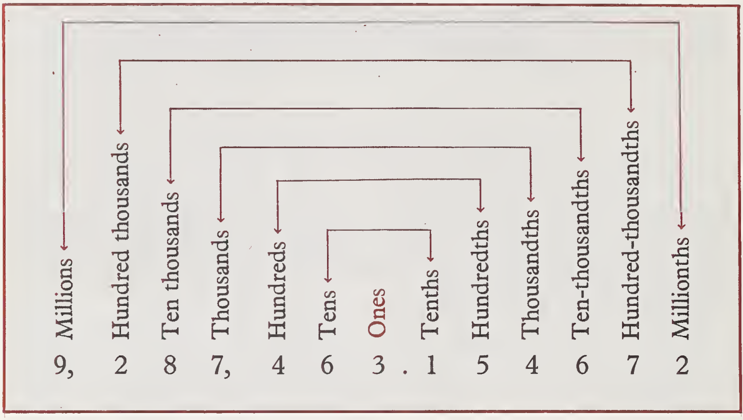
[W]

For each example in rows 6–8, find an estimated product by rounding. Then copy the example and multiply.

	a	b	c	d	e
6.	2.84 ×4.7	3.67 ×1.8	2.08 ×7.4	2.844 ×35	$12.55 ×4.2
7.	3.64 ×1.2	7.9 ×3.7	4.28 ×8.4	3.22 ×4.5	$8.10 ×5.6
8.	2.6 ×5.7	3.81 ×3.4	10.30 ×2.6	5.026 ×3	$8.10 ×7.4

Smaller Decimals

Reading, through millionth [O]



This number chart extends farther to the right than those you have had before in this book.

1. In the chart, what is the name of the place that is farthest left? farthest right? in the middle?

2. Tell the name of each place in the whole-number part of the chart and then the name of the place that balances it in the decimal-fraction part.

Begin this way: "Ten's place is balanced by tenth's place; hundred's place is balanced by _?_ place"; and so on.

3. We read the number in the chart this way:

9 million 287 thousand 463 and 154,672 millionths.

a. What place gave a name for the decimal fraction? In any decimal, does the name of the last used place farthest to the right always show what the fractional unit is? Explain.

b. What does the word "and" stand for as you read the number?

4. Use the chart if you need to, and read the following:

a. 6.2573 **b.** 9.709 **c.** 72.00625 **d.** 824.00075

It will help you to read and understand decimals of many places if you first say the decimal places beginning with tenth's.

5. In the chart on page 246, say the decimal-place names at the right of one's place: "Tenth's, hundredth's," and so on.

6. Name each decimal place in Ex. a–d. Then read each of the numbers.

a. 7.0059 **b.** 0.006342 **c.** 0.01479 **d.** 16.3006

7. A very small unit of weight called a *gram* equals about 0.002205 lb. Read this number.

8. A *micron* is a unit of length in microscope work. It equals 0.000039 inch. Can you read this number?

Products with More than Three Decimal Places

[O]

1. Find the product of 3.25 and 0.95.

a. Look at the box and *think*, "2 decimal places in one factor and 2 in the other; that's 4 places for the product. I count 4 places from right to left and then put in the decimal point." This is called "pointing off." The product is _?_.

b. Now say the work as you estimate the product. Why is 3.0875 a sensible answer?

$$\begin{array}{r} 3.25 \\ \times 0.95 \\ \hline 1625 \\ 2925 \\ \hline 3\underset{\overset{\uparrow}{\text{④}}}{0}\underset{\overset{\uparrow}{\text{③}}}{8}\underset{\overset{\uparrow}{\text{②}}}{7}\underset{\overset{\uparrow}{\text{①}}}{5} \end{array}$$

2. Tell how to point off each product. Read each product.

a. 0.46 × 1.05 = 4830 **c.** 0.3 × 0.1264 = 3792

b. 0.42 × 3.2764 = 1376088 **d.** 0.46 × 0.0285 = 13110

[W]

Copy and multiply to find

	a	b	c	d
3.	0.075 × 4.25	0.25 × 5.875	9.5 × 0.0375	0.375 × 4.8
4.	0.875 × 8.96	0.625 × 0.34	0.125 × 9.78	1.83 × 36.6

▶ **Extra Practice.** For more practice, work Sets 100 and 101.

Problems with Decimals

[O]

Tell the example you will write for each problem.

1. In 1940 the population of Atkins was 5,725. In 1950 it was 1.2 times as great. What was the population in 1950?

2. At 2.8 mi. an hour, how far can Joe walk in 1.5 hr.?

3. Shoes which once cost $3.75 now cost 2.4 times as much. What is the present cost?

4. At the rate of 160 words a minute, how many words can Jack read in 3.75 min.?

5. Remembering that $\frac{1}{2} = 0.5$ and $\frac{1}{4} = 0.25$, multiply $\frac{1}{4}$ by $7\frac{1}{2}$ using decimals instead of common fractions.

6. If $\frac{1}{4}$ lb. of fish is allowed at a restaurant for a portion, how much would be allowed for $4\frac{1}{2}$ portions? Show how to solve by common fractions and by decimals.

[W]

Now write your work for problems 1–6.

So You Won't Forget!

[O]

In Ex. 1–3, tell what number you will get if you

1. round to tenths: 5.29 0.74 70.258 3.98 8.02
2. round to hundredths: 0.254 7.637 2.397 1.703
3. round to thousandths: 4.06257 0.00738 2.0396

4. In the example in the box, the mixed decimal 8.72 is between 8 and 9. Which is it nearer? Since 3 × 8 = 24, and 3 × 9 = 27, the answer must be between 24 and 27. Why is it nearer to 27?

$$\begin{array}{r} 8.72 \\ \times 3 \\ \hline 26.16 \end{array}$$

As in Ex. 4, estimate the products for

5. 6 × 2.13
6. 7 × 4.82
7. 12 × 2.61
8. 3.842 × 5
9. 2.305 × 15
10. 0.624 × 3

Work for Young Experimenters

Supplementary activity [O]

4.12 × 28.9 = ?

Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths	
	2	8.	9			
×		4.	1	2		
			5	7	8	(hundredths × tenths = thousandths)
		2	8	9		(tenths × tenths = hundredths)
1	1	5	6			(whole number × tenths = tenths)
1	1	9.	0	6	8	

1. Janet wrote multiplication examples with all the points in a straight line, as in addition and subtraction with decimals. Why is it sensible to write the multiplier where she did?

Study the following to help you think the partial products as Janet did:

First partial product:

2 hundredths × 289 tenths = $\frac{2}{100} \times \frac{289}{10} = \frac{578}{1,000}$, or 578 thousandths.
Or, as a short cut, *think*, "hundreds × tenths = thousandths."
Is Janet's first partial product written to show it as thousandths?
(We do not use decimal points in partial products.)

Second partial product:

1 tenth × 289 tenths = $\frac{1}{10} \times \frac{289}{10} = \frac{289}{100}$, or 289 hundredths.
Or, as a short cut, *think*, "tenths × tenths = hundredths."
Is Janet's second partial product written to show it as hundredths?

Third partial product:

4 × 289 tenths = $4 \times \frac{289}{10} = \frac{1,156}{10}$, or 1,156 tenths.
Or, as a short cut, *think*, "a whole number × tenths = tenths."
Is Janet's third partial product written to show it as tenths?

2. At the board, work Janet's example in the way you have been using to see if you get the same product as Janet did.

[W]

Multiply in Janet's way. Then check by your own way.

3. 2.4 × 0.85 4. 0.39 × 6.7 5. 2.7 × 8.64 6. 3.85 × 7.92

Practice with Whole Numbers

M. and D. [W]

Copy and multiply.

	a	b	c	d	e
1.	$\begin{array}{r}380\\ \times 17\\ \hline\end{array}$	$\begin{array}{r}475\\ \times 86\\ \hline\end{array}$	$\begin{array}{r}2{,}809\\ \times 48\\ \hline\end{array}$	$\begin{array}{r}7{,}510\\ \times 70\\ \hline\end{array}$	$\begin{array}{r}162\\ \times 259\\ \hline\end{array}$
2.	$\begin{array}{r}735\\ \times 204\\ \hline\end{array}$	$\begin{array}{r}527\\ \times 369\\ \hline\end{array}$	$\begin{array}{r}780\\ \times 356\\ \hline\end{array}$	$\begin{array}{r}405\\ \times 780\\ \hline\end{array}$	$\begin{array}{r}295\\ \times 600\\ \hline\end{array}$

Divide. Write any remainder with R.

3.	$24\overline{)6{,}115}$	$16\overline{)612}$	$14\overline{)7{,}910}$	$27\overline{)1{,}302}$	$214\overline{)1{,}712}$
4.	$28\overline{)5{,}614}$	$36\overline{)981}$	$15\overline{)6{,}105}$	$46\overline{)1{,}106}$	$189\overline{)1{,}521}$

Practice with Fractions and Decimals

A., S., M., D. [W]

Add or subtract as the sign tells you in Ex. 1–8.

1.	$\begin{array}{r}3.6\\2.8\\7.0\\9.6\\+0.9\\ \hline\end{array}$	2.	$\begin{array}{r}0.75\\0.58\\6.02\\3.58\\+0.07\\ \hline\end{array}$	3.	$\begin{array}{r}6.042\\-1.597\\ \hline\end{array}$	4.	$\begin{array}{r}3.000\\+6.524\\ \hline\end{array}$
				5.	$\begin{array}{r}0.402\\-0.315\\ \hline\end{array}$	6.	$\begin{array}{r}2.004\\+1.584\\ \hline\end{array}$

7.	$\begin{array}{r}3\frac{1}{4}\\+2\frac{1}{2}\\ \hline\end{array}$	$\begin{array}{r}\frac{7}{15}\\+8\frac{2}{3}\\ \hline\end{array}$	$\begin{array}{r}2\frac{3}{4}\\+6\frac{1}{3}\\ \hline\end{array}$	$\begin{array}{r}8\frac{2}{5}\\+4\frac{1}{2}\\ \hline\end{array}$	$\begin{array}{r}5\\+3\frac{3}{8}\\ \hline\end{array}$
8.	$\begin{array}{r}2\frac{7}{10}\\-\frac{3}{10}\\ \hline\end{array}$	$\begin{array}{r}2\frac{1}{4}\\+1\frac{3}{4}\\ \hline\end{array}$	$\begin{array}{r}7\\-6\frac{7}{8}\\ \hline\end{array}$	$\begin{array}{r}8\frac{3}{8}\\-2\frac{5}{6}\\ \hline\end{array}$	$\begin{array}{r}6\frac{2}{3}\\+4\frac{3}{4}\\ \hline\end{array}$

Multiply or divide as the sign tells you in rows 9–11.

9.	$2 \times \frac{3}{8}$	$\frac{5}{8} \div 10$	$5\frac{5}{6} \times \frac{3}{5}$	$\frac{3}{4} \div \frac{9}{10}$	$3\frac{1}{3} \times 1\frac{1}{2} \times \frac{3}{5}$
10.	$1\frac{1}{8} \times 4$	$\frac{3}{8} \times \frac{4}{5}$	$2 \times 4\frac{2}{3}$	$4\frac{1}{3} \times 6$	$6\frac{4}{5} \div 2\frac{1}{8}$
11.	$24 \div 64$	$4\frac{1}{2} \times \frac{2}{3}$	$10 \times 1\frac{2}{3}$	$2\frac{1}{4} \times 1\frac{1}{3}$	$4\frac{2}{3} \div 3\frac{1}{9}$

Do You Understand?

Test of Information and Meaning 6

1. Write the following decimal fractions as common fractions:

a. 0.5; **b.** 0.64; **c.** 0.125; **d.** 0.08; **e.** 0.005; **f.** 0.075

2. Write as decimal fractions:

a. $\frac{3}{100}$; **b.** $\frac{75}{100}$; **c.** $\frac{7}{1{,}000}$; **d.** $\frac{345}{1{,}000}$; **e.** $\frac{25}{1{,}000}$; **f.** $\frac{6}{100}$

3. Which is larger:

a. 1.01 or 1.10? **b.** 0.984 or 1.03? **c.** 6 or 5.875?

4. Round to tenths: **a.** 16.06; **b.** 31.97; **c.** 20.197

5. Round to hundredths: **a.** 0.651; **b.** 3.896; **c.** 0.073

6. Copy this number and write above each figure the name of its place value: 1,493.8526

7. Write the number in Ex. 6 by copying and completing the following: _?_ thousand _?_ hundred _?_-three and _?_ thousand five _?_ twenty-six _?_.

8. What does 0 mean in the number 0.875?

9. Copy the number 0.250 and reduce it to lower terms.

10. Write the following in columns and find answers:

a. 0.75 + 0.8 + 0.125 + 0.6 **b.** 2.75 ft. − 1.5 ft.

11. Write in lowest terms the common fraction which each of these equals:

a. 0.5 **b.** 0.375 **c.** 0.875 **d.** 0.25 **e.** 0.8 **f.** 0.75

12. How many places at the right of one's place will there be in the product of

a. 8 × 4.6? **b.** 9.7 × 5? **c.** 0.5 × 0.9? **d.** 5.14 × 7.25?

13. What is the product of

a. 10 × 7.5? **b.** 1,000 × 0.82? **c.** 100 × 2.975?

14. Write the example you would use for estimating the product of 2.8 × 5.25

Can You Solve Problems?

Problem Test 6

1. Mr. Shaw lives 3.9 miles from the place where he works. He makes 2 round trips each day. How far does he drive in a day going to and from work?

2. When milk is 26.5¢ a quart or 2 quarts for 50¢, how much money can be saved by buying 2 quarts at a time?

3. Elsa's sister, June, works in a store. Each time June cuts off a piece of yard goods from a bolt, or roll, of material, she has to write on the bolt the number of yards that are left. She keeps the record in decimals to make the figuring easier. If the last record is 30.75 yards and June cuts off 3.25 yards, what does she write on the bolt?

4. Bill's brother ran three times around the half-mile track. How far did he run? (Use a decimal for "half mile.")

5. Baseball mitts were on sale at $4.69 each. What did it cost the school to buy 3 of them?

6. Joe's brother Jack goes to a shop class where they measure some lengths to the nearest hundredth of an inch. A rectangular steel plate measured 4.25 inches long and 2.75 inches wide. How much greater was the length than the width?

7. How much will 2.5 pounds of cheese cost at $0.82 a pound?

8. How much candy is there in two candy bars, one of which weighs 1.5 ounces and the other 2.75 ounces?

9. Tom's father bought 30.5 feet of Manila rope at 7¢ a foot. How much did he pay for the rope?

10. For baked seafood, Mrs. Hancort used 1 lb. of cooked haddock, a 7.5-ounce can of lobster meat, a 6.5-ounce can of crabmeat, and a 5.5-ounce can of shrimps. How much seafood did she use?

Do You Make Mistakes?

Diagnostic Test 6

Copy in columns and work.

	a	b	c	Study Pages	Practice Sets
1.	0.9 + 0.4	1.7 + 3.5	75.4 + 69.8	220	92
2.	2.5 – 0.9	7.3 – 2.8	85.2 – 78.9	221	92
3.	4.29+3.81	3.42–1.29	0.725–0.198	225	93
4.	0.4 + 7.25	9.4 – 6.25	5.75 – 0.125	226, 227	
5.	8 × 0.5	4 × 1.75	3 × 5.286	232–235	94
6.	0.125 × 5	5.75 × 4	63.9 × 75	238–240	96
7.	5.7 × 0.9	25.75×1.8	4.65 × 0.25	242–247	97–101

How Well Can You Figure?

Computation Test 6

Copy, and do what the signs tell you to do.

1. $\begin{array}{r}21.7\\ +5.2\\ \hline\end{array}$ 2. $\begin{array}{r}0.75\\ -0.29\\ \hline\end{array}$ 3. $\begin{array}{r}0.9\\ \times 4\\ \hline\end{array}$ 4. $\begin{array}{r}75\\ \times 0.3\\ \hline\end{array}$ 5. $\begin{array}{r}8.005\\ -4.187\\ \hline\end{array}$

6. $\begin{array}{r}95.5\\ +8.75\\ \hline\end{array}$ 7. $\begin{array}{r}46.6\\ -5.875\\ \hline\end{array}$ 8. $\begin{array}{r}0.28\\ \times 5\\ \hline\end{array}$ 9. $\begin{array}{r}1.125\\ \times 8\\ \hline\end{array}$ 10. $\begin{array}{r}72.25\\ \times 1.5\\ \hline\end{array}$

11. $\begin{array}{r}9.6\\ \times 3.8\\ \hline\end{array}$ 12. $\begin{array}{r}5.4\\ \times 0.125\\ \hline\end{array}$ 13. $\begin{array}{r}69.8\\ \times 4.29\\ \hline\end{array}$ 14. $\begin{array}{r}8.67\\ \times 0.8\\ \hline\end{array}$ 15. $\begin{array}{r}24.7\\ \times 0.003\\ \hline\end{array}$

16. $\begin{array}{r}10.06\\ -6.58\\ \hline\end{array}$ 17. $\begin{array}{r}43.04\\ +8.972\\ \hline\end{array}$ 18. $\begin{array}{r}0.03\\ \times 0.7\\ \hline\end{array}$ 19. $\begin{array}{r}20.8\\ +7.63\\ \hline\end{array}$ 20. $\begin{array}{r}4\\ -0.092\\ \hline\end{array}$

7

Buying for the Baseball Team

Readiness for D. of decimals; dividing money numbers [W]

When the sixth-grade boys told Mr. King, the principal, that they would like to have a baseball team, he suggested that they find out what it would cost. The boys chose a committee to visit several stores on Saturday and report the costs to the class on Monday.

1. One store gave the committee a price of $59.22 for 9 uniforms. How much was this for a uniform?

2. At another store, the salesman thought the team would need to have extra uniforms and gave the committee a total price of $78 for 12 uniforms. How much was this for a uniform? (Use $78.00 for the dividend.)

3. Which of the two stores gave the committee the lower price per uniform?

4. The boys wanted to buy 1 doz. baseballs and found that the cost of those would be $21.48. How much was this a ball?

Because the total cost seemed too great, the boys were about to give up planning when Mr. White, the father of one of the boys, said that he would provide $75 toward uniforms if the boys would earn money to buy the other equipment needed.

5. If the boys used the entire $75 to buy 9 uniforms, how much would they pay for each uniform?

6. Using just the $75, what could they pay for each uniform if they decided to buy 10? 12?

7. The committee said that one store had given them a price of $5.40 for 6 bats. How much is this for each bat?

8. If the team finally spent $21.48 for baseballs (Ex. 4), $5.40 for bats (Ex. 7), and $78 for uniforms (Ex. 2), what was the total cost? How much money did the boys have to raise?

When We Divide Money Numbers

Readiness [O]

1. On page 255, you were really dividing decimals. Box A shows the work for Ex. 1 on page 255.

In the last division (72 ÷ 9), were you dividing tenths, hundredths, or thousandths?

Does the last quotient figure, 8, show tenths, hundredths, or thousandths?

How does the decimal point in the dividend show where the decimal point in the quotient is to be placed?

A

```
     $6.58
 9)$59.22
    54
     5 2
     4 5
       72
       72
```

2. In Ex. 2 on page 255, you had the whole number $78 to divide by the whole number 12.

Why did we write $78 with two 0's, as in box B?

What can you tell about the decimal points in the dividend and in the quotient?

B

```
      $6.50
 12)$78.00
     72
      6 0
      6 0
        0
```

C

```
      $6½
 12)$78
     72
      6
 6/12 = 1/2
```

D

```
      $6.5
 12)$78.0
     72
      6 0
      6 0
```

E

```
      $6.500
 12)$78.000
     72
      6 0
      6 0
        00
```

3. Study the work in box C.

a. Why does the quotient in box B mean the same as the quotient in box C?

b. If you want to show cents instead of a fraction in a quotient, and the dividend is a whole number (as in box C), what can you do to the dividend?

c. Why does $78.00 = $78?

d. Could you have worked as in box D or in box E, instead of as in box B? Why wouldn't you do so?

Decimals in the Quotient

Larger whole number ÷ smaller whole number [O]

You know how to divide one whole number by another, as in boxes A and B.

1. Tell the remainder in box A; in box B.

2. How do we show the division of the remainder in each box?

3. Now study the work in box C. Why can we say that the quotient, 8.4, equals the quotient, $8\frac{2}{5}$, in box A?

Why did we write only one 0 after the decimal point in the dividend? Could we have written two 0's?

The one 0 (box C) was brought down beside the remainder, 2 ones, making 20 tenths. 20 tenths divided by 5 is 4 tenths. The 4 was written in the quotient in _?_ place.

4. Does the quotient in box D equal that in box B?

Why did we write two 0's after the decimal point in the dividend in box D?

After you bring down the first 0, you divide _?_ tenths by 24. Where in the quotient do you write 2? Why?

After you bring down the second 0, you divide 120 hundredths by 24. Where in the quotient do you write the quotient figure 5? Why?

A

$$\begin{array}{r} 8\frac{2}{5} \\ 5\overline{)42} \\ \underline{40} \\ 2 \end{array}$$

B

$$\begin{array}{r} 4\frac{1}{4} \\ 24\overline{)102} \\ \underline{96} \\ 6 \end{array}$$

$$\frac{6}{24} = \frac{1}{4}$$

C

$$\begin{array}{r} 8.4 \\ 5\overline{)42.0} \\ \underline{40} \\ 2\,0 \\ \underline{2\,0} \end{array}$$

D

$$\begin{array}{r} 4.25 \\ 24\overline{)102.00} \\ \underline{96} \\ 6\,0 \\ \underline{4\,8} \\ 1\,20 \\ \underline{1\,20} \end{array}$$

[W]

Divide as in boxes C and D.

5. $8\overline{)92}$ 6. $5\overline{)219}$ 7. $6\overline{)195}$ 8. $8\overline{)506}$

9. $36\overline{)342}$ 10. $15\overline{)114}$ 11. $48\overline{)156}$ 12. $64\overline{)432}$

Changing a Fraction to a Decimal

Small whole number ÷ large whole number [O]

1. Three of these 4 boys went skiing. What decimal part of the group was that?

First you can *think*, "$\frac{3}{4}$ of the boys went skiing." Then *think*, "I could write $\frac{3}{4}$ as $3 \div 4$, or $4\overline{)3}$." See how the division is written in box A.

In box A, why have we written a decimal point and two 0's after the 3? Explain the division.

Explain the check. Why does 3.00 equal 3?

A

$\frac{3}{4}$ = what decimal?

$$\begin{array}{r} 0.75 \\ 4\overline{)3.00} \\ \underline{2\,8} \\ 20 \\ \underline{20} \end{array}$$

Check

$$\begin{array}{r} 0.75 \\ \underline{\times 4} \\ 3.00 \end{array}$$

B

$$\begin{array}{r} 0.625 \\ 8\overline{)5.000} \\ \underline{4\,8} \\ 20 \\ \underline{16} \\ 40 \\ \underline{40} \end{array}$$

Check

$$\begin{array}{r} 0.625 \\ \underline{\times 8} \\ 5.000 \end{array}$$

2. Explain how the fraction $\frac{5}{8}$ is changed to its equivalent decimal in box B. Explain the check.

3. On the board, change the following to their equivalent decimals:

a. $\frac{1}{4}$ **b.** $\frac{1}{2}$ **c.** $\frac{1}{8}$ **d.** $\frac{7}{8}$ **e.** $\frac{3}{8}$

Sometimes, in changing a common fraction to a decimal, the division never ends. In box C, no matter how long we kept on writing 0's in the dividend and dividing, there would always be a remainder of 2.

C

$$\begin{array}{r} 0.666 \\ 3\overline{)2.000} \\ \underline{1\,8} \\ 20 \\ \underline{18} \\ 20 \\ \underline{18} \\ 2 \end{array}$$

D

$$\begin{array}{r} 0.333 \\ 3\overline{)1.000} \\ \underline{9} \\ 10 \\ \underline{9} \\ 10 \\ \underline{9} \\ 1 \end{array}$$

4. What remainder in box D would always be the same no matter how many times you divide?

5. Round to hundredths the quotient in box C; in box D.

6. In Ex. 5, you rounded the three-place quotients in boxes C and D to the nearest _?_. Boxes E and F show another way to express the quotients as hundredths. Explain.

E

$$\begin{array}{r} 0.66\frac{2}{3} \\ 3\overline{)2.00} \\ \underline{1\,8} \\ 20 \\ \underline{18} \\ 2 \end{array}$$

F

$$\begin{array}{r} 0.33\frac{1}{3} \\ 3\overline{)1.00} \\ \underline{9} \\ 10 \\ \underline{9} \\ 1 \end{array}$$

[W]

Change the following to decimal fractions. After each dividend, write a decimal point and use as many 0's as are needed to make the division come out even.

	a	b	c	d	e	f	g	h
7.	$\frac{2}{5}$	$\frac{3}{25}$	$\frac{5}{16}$	$\frac{1}{5}$	$\frac{3}{16}$	$\frac{11}{20}$	$\frac{4}{5}$	$\frac{7}{10}$
8.	$\frac{3}{20}$	$\frac{3}{5}$	$\frac{7}{40}$	$\frac{9}{100}$	$\frac{5}{32}$	$\frac{9}{16}$	$\frac{8}{25}$	$\frac{3}{10}$

For each example in rows 9 and 10, find a three-place quotient and then round it to the nearest hundredth.

9.	$\frac{5}{6}$	$\frac{7}{12}$	$\frac{1}{9}$	$\frac{5}{7}$	$\frac{2}{15}$	$\frac{5}{9}$	$\frac{1}{7}$	$\frac{1}{6}$
10.	$\frac{3}{7}$	$\frac{7}{9}$	$\frac{4}{7}$	$\frac{2}{9}$	$\frac{8}{9}$	$\frac{2}{7}$	$\frac{4}{9}$	$\frac{6}{7}$

Now write each answer for rows 9 and 10 as a two-place decimal with the remainder in a fraction, as in boxes E and F.

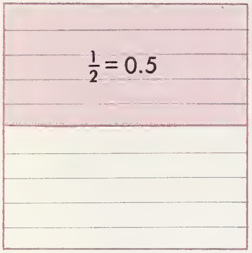
Extra Practice. For more practice, work Sets 102–103.

Equivalent Fractions and Decimals

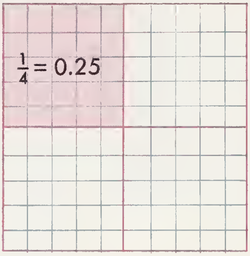
[O]

Explain how each box shows that the common fraction equals the decimal fraction.

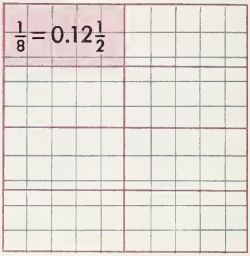
A



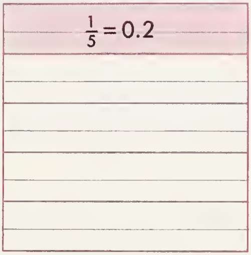
B



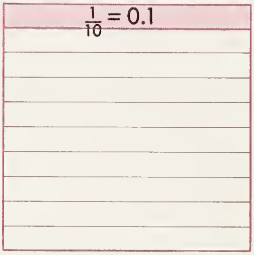
C



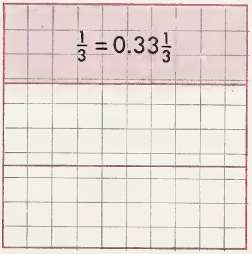
D



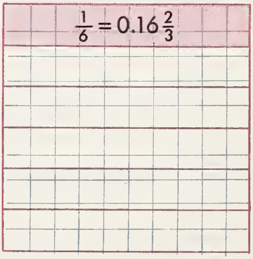
E



F



G



[O]

1. Charles couldn't remember the decimal equivalent of $\frac{1}{8}$, but he knew that $\frac{1}{4} = 0.25$. He *thought*, "$\frac{1}{8} = \frac{1}{2}$ of $\frac{1}{4}$. Then the decimal equivalent of $\frac{1}{8}$ must be $\frac{1}{2}$ of 0.25, or _?_."

2. After Charles had found the decimal equivalent of $\frac{1}{8}$, how could he quickly find the equivalent of $\frac{3}{8}$? of $\frac{5}{8}$? of $\frac{7}{8}$?

3. You know that the decimal equivalent of $\frac{1}{10}$ is 0.1 or 0.10. Tell how you would use this information to find a decimal equivalent for $\frac{7}{10}$; for $\frac{1}{5}$; for $\frac{4}{5}$.

4. Explain how you can use the fact that $\frac{1}{4} = 0.25$ to find the decimal equivalent of $\frac{1}{12}$; of $\frac{1}{16}$.

5. How can you use the decimal equivalent of $\frac{1}{2}$ to find an equivalent for $\frac{1}{6}$?

6. Explain how you can quickly find the decimal equivalent of $\frac{1}{20}$ when you know that $\frac{1}{5} = 0.2$ or 0.20. Then give the decimal equivalent of $\frac{7}{20}$; of $\frac{11}{20}$; of $\frac{19}{20}$.

[W]

Copy and complete the following table. Use the boxes on page 260 if you need to. See if you know all the equivalents.

Halves Fourths Eighths	Halves Thirds Sixths	Halves Fifths Tenths
$\frac{1}{2} = 0.5$	$\frac{1}{2} = 0.5$	$\frac{1}{2} = 0.5$
$\frac{1}{4} =$ _?_	$\frac{1}{3} =$ _?_	$\frac{1}{5} =$ _?_
$\frac{3}{4} =$ _?_	$\frac{2}{3} =$ _?_	$\frac{2}{5} =$ _?_
$\frac{1}{8} =$ _?_	$\frac{1}{6} =$ _?_	$\frac{3}{5} =$ _?_
$\frac{3}{8} =$ _?_	$\frac{5}{6} =$ _?_	$\frac{4}{5} =$ _?_
$\frac{5}{8} =$ _?_		$\frac{1}{10} =$ _?_
$\frac{7}{8} =$ _?_		$\frac{3}{10} =$ _?_
		$\frac{7}{10} =$ _?_
		$\frac{9}{10} =$ _?_

Building the Highway

Dividing a decimal by a whole number [O]

1. The Bell Company is finishing the last bit of highway to connect with Route 9. In 2 days they surfaced 0.8 mi. What was their average a day?

To find the average, why must we divide 0.8 mi. into 2 equal distances?

8 tenths ÷ 2 = _?_ tenths, or 0.4. Explain the multiplying and subtracting in box A.

We divide tenths like ones. In box A, you divided tenths, so the quotient figure, 4, is written in _?_ place.

Where do we put the decimal point in the quotient? Why do we write 0 before it?

A

$$\begin{array}{r} 0.4 \\ 2\overline{)0.8} \\ \underline{8} \end{array}$$

2. When the Bell Company put down the road bed, it finished 4.2 mi. in 7 days. What was the average distance finished in a day? $\frac{1}{7}$ of 4.2 = 4.2 ÷ 7 (box B).

Think of 4.2 as 42 tenths. Explain the work in box B.

If you divide tenths by a whole number, why will the quotient show tenths?

How do you check the quotient?

B

$$\begin{array}{r} 0.6 \\ 7\overline{)4.2} \\ \underline{4\,2} \end{array}$$

[W]

Write the work for these, as in boxes A and B, to find how many tenths in each quotient:

3. 0.9 ÷ 3 = ?
4. 3.2 ÷ 8 = ?
5. 2.4 ÷ 6 = ?
6. 0.6 ÷ 2 = ?
7. 0.7 ÷ 7 = ?
8. 12.2 ÷ 2 = ?

[O]

9. The Bell crew surveyed 1.26 mi. in 3 days. That was an average of _?_ mi. a day (box C).

Tenths: 12 ÷ 3 = ?

Hundredths: 6 ÷ 3 = ?

In boxes A to C, what do you notice about the number of decimal places in the dividend and in the quotient?

C

$$\begin{array}{r} 0.42 \\ 3\overline{)1.26} \\ \underline{1\,2} \\ 6 \\ \underline{6} \end{array}$$

10. It took 14 days to make a piece of road 0.06 mi. long through a swamp. Find the average distance made a day to the nearest thousandth of a mile (box D).

a. To find an answer to the nearest thousandth, how many decimal places must we first get in the quotient?

Why do we change 0.06 to 0.0600?

b. Explain all the dividing in box D. To the nearest thousandth, is the answer 0.004 mi. or 0.005 mi.?

c. Study and explain the check.

D

$$\begin{array}{r} 0.0042 \\ 14\overline{)0.0600} \\ \underline{56} \\ 40 \\ \underline{28} \\ 12 \end{array}$$

Check:

$$\begin{array}{r} 0.0042 \\ \underline{\times 14} \\ 168 \\ \underline{42} \\ 0.0588 \\ \underline{+12} \\ 0.0600 \end{array}$$

[W]

Divide and check. Round uneven quotients to hundredths.

	a	b	c	d	e
11.	$6\overline{)28.8}$	$9\overline{)47.7}$	$21\overline{)7.287}$	$52\overline{)87.36}$	$33\overline{)0.712}$
12.	$8\overline{)95.2}$	$7\overline{)5.25}$	$81\overline{)0.972}$	$43\overline{)103.2}$	$63\overline{)1.328}$
13.	$5\overline{)0.005}$	$6\overline{)4.02}$	$42\overline{)1.554}$	$62\overline{)192.82}$	$93\overline{)2.519}$

Divide, rounding each answer to the nearest thousandth.

14.	$82\overline{)1.984}$	$53\overline{)7.82}$	$16\overline{)28.41}$	$28\overline{)0.9268}$	$18\overline{)0.0628}$
15.	$38\overline{)261.4}$	$46\overline{)0.1429}$	$72\overline{)1.1645}$	$21\overline{)2.408}$	$54\overline{)113.076}$

➤ **Extra Practice.** For more practice, work Sets 104–105.

Dividing Decimals

Divisor a whole number [W]

Write your work. If an answer does not come out even in thousandth's place, round it to the nearest hundredth.

1. Bob's father paid $2.88 for three water pails to use at camp. What was the price per pail?

2. A loaf of bread was marked "Net weight, 16.5 ounces." What was the weight of half a loaf?

3. On the speedometer of his father's car Billy measured the distance from his home to the postoffice. The round-trip distance going and coming the same way was 23.7 miles. How far was it from Billy's home to the postoffice?

4. Mr. Douglass divided his land along the edge of a lake into four house lots. The surveyor found the distance along the waterfront to be 526.35 feet. If Mr. Douglass made all the lots the same width, how much waterfront did each lot have?

5. Claire paid $2.94 for 6 yards of canvas to cover the porch chairs. What was the price per yard?

6. Spanish coins once were commonly used in some parts of the United States. The Spanish *real* (re-al) was one eighth of a dollar. When merchants were short of coins they sometimes cut a Spanish silver dollar into 8 parts, called "bits," and used the parts as *reals*. How much would one "bit" be worth in cents? (Do not round off.) How much is "two bits"?

7. In shop class, Joe had to divide a metal strip into four equal parts. He found that the strip was 8.376 inches long. How long should each part be?

8. The three cottages which Ann's father rents in the summer are all connected on the same meter for electricity. Last year the season's bill for the cottages was $34.88. This was how much, on the average, for a cottage?

Have You Learned Well?

[W]

Copy and do what the signs say.

	a	b	c	d	e
1.	35.6 91.7 +1.3	6.14 3.76 +5.28	46.89 7.46 +39.72	\$91.76 0.89 +3.16	\$461.27 24.42 +38.97
2.	6.807 −5.962	2.096 −0.128	4.024 −0.176	\$200.30 −16.98	\$741.50 −264.87
3.	2.09 ×0.76	741 ×0.36	5.309 ×1.04	\$35.62 ×100	\$62.18 ×4.91
4.	$1\frac{3}{4} + 2\frac{5}{8}$	$7\frac{1}{3} + \frac{5}{6}$	$3\frac{4}{5} + 1\frac{3}{10}$	$5\frac{2}{3} + \frac{3}{4}$	$\frac{4}{5} + 2\frac{1}{2}$
5.	$3\frac{1}{4} - 2\frac{1}{3}$	$6 - \frac{7}{10}$	$4\frac{1}{5} - 1\frac{7}{10}$	$2\frac{3}{16} - \frac{5}{8}$	$1\frac{5}{12} - \frac{2}{3}$
6.	$1\frac{1}{2} \times 6$	$2\frac{2}{3} \times \frac{5}{8}$	$\frac{5}{24} \times 1\frac{1}{2}$	$2\frac{2}{15} \times \frac{5}{8}$	$3\frac{25}{100} \times 2\frac{5}{10}$
7.	$20 \div 6\frac{2}{3}$	$\frac{5}{6} \div \frac{2}{3}$	$\frac{7}{12} \div \frac{7}{8}$	$2\frac{4}{10} \div 6$	$2\frac{3}{15} \div \frac{3}{5}$

Find quotients to the nearest hundredth.

8.	$7\overline{)61.8}$	$21\overline{)96.26}$	$13\overline{)42.18}$	$7\overline{)\$3.42}$	$10\overline{)\$5.68}$

Changing to Fractions or to Decimals

[W]

Give the equivalent common fraction in lowest terms.

	a	b	c	d	e	f
1.	0.16	0.64	0.35	0.375	0.075	0.80
2.	0.84	0.008	0.480	0.005	0.12	0.3125

Change to decimal form. Round any uneven quotient to the nearest hundredth.

3.	$2\frac{1}{4}$	$9\frac{2}{5}$	$\frac{3}{8}$	$\frac{7}{8}$	$3\frac{9}{20}$	$\frac{3}{5}$
4.	$1\frac{1}{10}$	$\frac{11}{20}$	$\frac{9}{40}$	$3\frac{7}{50}$	$2\frac{3}{16}$	$\frac{1}{8}$
5.	$\frac{7}{12}$	$\frac{8}{9}$	$1\frac{4}{7}$	$6\frac{1}{3}$	$3\frac{5}{11}$	$2\frac{1}{6}$
6.	$\frac{4}{15}$	$1\frac{9}{32}$	$\frac{5}{18}$	$\frac{4}{21}$	$3\frac{11}{12}$	$\frac{3}{7}$

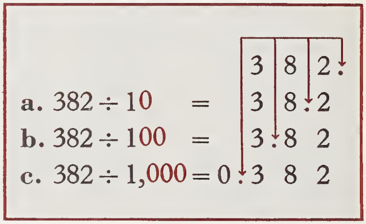
Dividing by 10 or 100 or 1,000

Meaning [O]

1. To find quickly 10×3.82, look at the factor 3.82 and think the decimal point one place to the right, as in _?_.

2. From Ex. 1, if the product, 38.2, is divided by the factor 10, we know that the quotient will be 3.82. Why?

In other words, to find $38.2 \div 10$, we can look at 38.2 and get the quotient, 3.82, by thinking of the decimal point as moved one place to the left.



3. In the box, if you think of the point as moved left,

a. 1 place (38.2), then 382 has been divided by _?_;

b. 2 places (3.82), then 382 has been divided by _?_;

c. 3 places (0.382), then 382 has been divided by _?_.

4. Divide by 10: **a.** 6.2; **b.** 0.98; **c.** 17; **d.** 3.108

5. Divide by 100: **a.** 364; **b.** 2.86; **c.** 0.07; **d.** 102.3

6. Divide the numbers in row 5 by 1,000.

➤ **Extra Practice.** For more practice, work Set 106.

Dividing by a Money Number

[O]

$0.27\overline{)2.00}$

equals

$27\overline{)200}$

1. At \$0.27 apiece, how many melons can I get for \$2.00? \$0.27's in \$2.00 = ?

Why should 200 cents ÷ 27 cents give the same answer as \$2.00 ÷ \$0.27?

Try to explain why it is easier to find $200 \div 27$ than $2.00 \div 0.27$

By what can we multiply both 0.27 and 2.00 to get the example $27\overline{)200}$? Work this example at the board.

2. Work at the board: **a.** $\$0.20\overline{)\$8.40}$; **b.** $\$0.64\overline{)\$1.92}$

When the Divisor Is a Decimal

Introduction [O]

A

a. $0.4\overline{)42}$

b. $0.015\overline{)0.24}$

c. $10.6\overline{)38.69}$

1. You know how to divide by a whole number and by a money number. Now you will learn to divide by a decimal fraction or a mixed decimal, as in box A.

Tell what kind of decimal each divisor is in Ex. a–c in the box.

With money numbers, you found that it is better to change the example so as to make the divisor a whole number. We can work the same way with any example that has a decimal divisor.

2. If you think of $4\overline{)3}$ as $\frac{3}{4}$, you can write, "$\frac{3}{4} = \frac{6}{8}$." This means that $4\overline{)3} = 8\overline{)6}$. What has been done to $4\overline{)3}$ to get the equivalent division $8\overline{)6}$?

3. By thinking the decimal point one place to the right, multiply these numbers by 10: 2.7; 6.3; 5.91; 0.35; 0.06; 7.

4. By thinking of the decimal point as moved two places to the right, multiply by 100: 2.47; 3.8; 0.5; 0.62; 0.004

5. By thinking of the point as moved three places to the right, multiply by 1,000: 0.85; 0.042; 7.318; 12.0042; 3.2

6. In box B, by what are divisor and dividend multiplied in changing $0.4\overline{)42}$ to $4\overline{)420}$? Why is 0 put at the right of 42?

Now explain the changes in Ex. b and c.

B

a. $0.4\overline{)42} = 4\overline{)420}$

b. $0.015\overline{)0.24} = 15\overline{)240}$

c. $10.6\overline{)38.69} = 106\overline{)386.9}$

[W]

7. Divide in Ex. a–c. Use the form at the right in box B—that is, the one with divisors changed to whole numbers.

If the divisor is a decimal, you may multiply both divisor and dividend by 10 or 100 or 1,000, and so on, in order to make the divisor a whole number.

The Divisor a Decimal

Tenthes; hundredths; thousandths [O]

1. An airplane flew 125 mi. in 0.4 hr. This was at what rate? That is, at how many miles per hour? $0.4\overline{)125} = ?$

What did we do to get $4\overline{)1{,}250}$ in box A? Explain the dividing.

If $1{,}250.0 \div 4 = 312.5$, then $125 \div 0.4 = 312.5$. Explain.

Use the statement just above to help you explain the check in box A. In checking, why is it better to use the original divisor instead of the changed divisor?

A

$$0.4\overline{)125} = 4\overline{)1{,}250}$$

$$\begin{array}{r}
312.5 \\
4\overline{)1{,}250.0} \\
\underline{1\,2} \\
5 \\
\underline{4} \\
10 \\
\underline{8} \\
20 \\
\underline{20}
\end{array}$$

Check

$$\begin{array}{r}
312.5 \\
\underline{\times 0.4} \\
125.00
\end{array}$$

B

$$0.2\overline{)0.75} = 2\overline{)7.5}$$

$$\begin{array}{r}
3.75 \\
2\overline{)7.50} \\
\underline{6} \\
1\,5 \\
\underline{1\,4} \\
10 \\
\underline{10}
\end{array}$$

Check

$$\begin{array}{r}
3.75 \\
\underline{\times 0.2} \\
0.750
\end{array}$$

2. In a hard storm, rain fell at the rate of 0.2 in. a minute. In all, 0.75 in. of rain fell. How many minutes did it rain? $0.2\overline{)0.75} = ?$

a. Explain the work in box B.

b. On the board, check by common fractions: $\frac{75}{100} \div \frac{2}{10} = \frac{75}{100} \times \frac{10}{2} = ?$

3. For rows 4 and 7, read each example with whole-number divisor.

[W]

Work and check as in boxes A and B.

	a	b	c	d
4.	$0.6\overline{)3.6}$	$0.8\overline{)1.44}$	$0.9\overline{)0.369}$	$0.16\overline{)80}$
5.	$0.12\overline{)10.8}$	$0.17\overline{)0.952}$	$0.005\overline{)0.65}$	$0.15\overline{)4.05}$
6.	$0.76\overline{)1{,}824}$	$0.056\overline{)24.08}$	$0.65\overline{)3.510}$	$0.93\overline{)3.441}$
7.	$0.025\overline{)0.075}$	$0.06\overline{)8.7}$	$0.054\overline{)8.10}$	$0.015\overline{)8.10}$

➤ **Extra Practice.** For more practice, work Sets 107–108.

The Divisor a Mixed Decimal

[O]

1. To work Ex. A–C below, we first changed each divisor to a whole number. Explain how this was done.

A

$1.2\overline{)46}$

$$\begin{array}{r}
38.333 \\
12\overline{)460.000} \\
\underline{36} \\
100 \\
\underline{96} \\
4\ 0 \\
\underline{3\ 6} \\
40 \\
\underline{36} \\
40 \\
\underline{36} \\
4
\end{array}$$

38.33, Ans.

B

$1.26\overline{)1.129}$

$$\begin{array}{r}
0.896 \\
126\overline{)112.900} \\
\underline{100\ 8} \\
12\ 10 \\
\underline{11\ 34} \\
760 \\
\underline{756} \\
4
\end{array}$$

0.90, Ans.

C

$2.08\overline{)0.087}$

$$\begin{array}{r}
0.041 \\
208\overline{)8.700} \\
\underline{8\ 32} \\
380 \\
\underline{208} \\
172
\end{array}$$

0.04, Ans.

2. The answers in boxes A–C are rounded to the nearest _?_. Why did we first carry each quotient to thousandths?

3. In box B, why are there two 0's at the right of the dividend 112.9? Explain how the quotient 0.896 is rounded.

4. In C, to divide 8.70 we *think*, "870 hundredths." Why?

[W]

Divide. Round uneven quotients to the nearest hundredth.

	a	b	c	d	e
5.	$2.4\overline{)0.5}$	$1.5\overline{)46.5}$	$1.02\overline{)9}$	$1.1\overline{)24.7}$	$2.7\overline{)0.57}$
6.	$2.4\overline{)8.64}$	$3.2\overline{)1.408}$	$0.006\overline{)3}$	$2.18\overline{)14}$	$0.19\overline{)183.35}$
7.	$37\overline{)22.2}$	$3.8\overline{)1.352}$	$0.32\overline{)5.7}$	$0.07\overline{)0.92}$	$1.6\overline{)0.096}$

➤ **Extra Practice.** For more practice, work Sets 109–110.

Practice in Dividing with Decimals

[W]

Copy each example. Divide until there is no remainder.

	a	b	c	d
1.	0.02)0.064	0.8)0.48	4.8)6	0.016)4.816
2.	0.50)35	2.4)96	8.1)0.81	0.009)30.6
3.	0.004)10	0.6)300	2.14)53.5	0.048)7.2
4.	0.0022)55	1.08)2.7	0.015)90	3.2)13.44

Find answers for these to the nearest hundredth:

5.	7)0.815	3)1.48	9)8.208	6)32.62
6.	11)0.32	36)285	24)166	1.4)3.82
7.	0.72)0.4	0.21)3.8	5.7)3.52	8.6)2

Give answers for these as hundredths and show any remainder in a common fraction in lowest terms:

8.	6)7	12)5	16)9	1.3)0.62
9.	2.1)0.96	0.15)0.37	2.2)1.5	3.2)1

In rows 10 and 11, change the common fractions to 2-place decimals (hundredths) and show any remainder in a fraction.

	a	b	c	d	e	f	g	h	i
10.	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{2}{5}$	$\frac{1}{6}$	$\frac{4}{5}$	$\frac{3}{10}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{2}{3}$
11.	$\frac{5}{6}$	$\frac{9}{10}$	$\frac{7}{8}$	$\frac{1}{5}$	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{3}{5}$	$\frac{1}{8}$	$\frac{7}{10}$

12. 0.7 is how many times as large as 0.07?

13. 0.002 is what part of 0.08?

14. How many places to the right do you *think* a decimal point to multiply a number by 100? by 1,000? by 10?

15. Does $250 \div 5$ have the same quotient as $2.5 \div 0.05$?

16. What part of 3 is 0.3? 17. What part of 2.5 is 0.025?

Three Kinds of Problems in M. and D.

With decimals [O]

You have worked the three kinds, or types, of problems in multiplication and division with whole numbers and common fractions. You work exactly the same way with decimal fractions. Study the three types below.

Finding the product.

Mr. Saks planted 0.75 of his 12-acre field to corn. How many acres did he plant to corn?

$0.75 \times 12 = n$ **You know the two factors.**

$n = ?$ **You multiply to find the product.**

Type I

$$\begin{array}{r} 12 \\ \times 0.75 \\ \hline \end{array}$$

Multiply

Finding the factor which shows a relationship, or ratio.

Mr. Saks planted 9 acres of his 12-acre field to corn. What decimal part of his whole field did he plant to corn?

$n \times 12 = 9$ **You know the product and one factor.**

$n = 9 \div 12$ **You divide to find the missing factor.**

In this division, the quotient shows relationship by showing *what part* 9 is *of* 12.

Sometimes a quotient shows *how many times.*

Type II

$12\overline{)9}$

Divide

Finding the other factor when the ratio factor is given.

Mr. Saks planted 9 acres of his field to corn. He said that this was 0.75 of the whole field. How many acres are in the whole field?

$0.75 \times n = 9$ **You know the product and one factor.**

$n = 9 \div 0.75$ **You divide to find the missing factor.**

Type III

$0.75\overline{)9} = 75\overline{)900}$

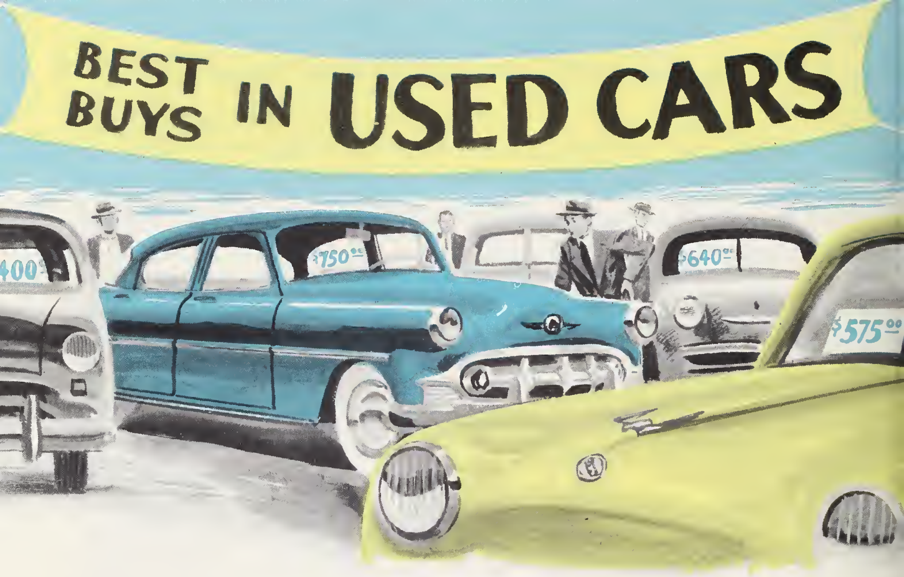
Divide

Tell which type of decimal problem each of these is:

1. Sue's story is 4 pages long. She has copied 2 pages of it. What decimal part of it has she copied?

2. Joe was to have 0.4 of all the cherries he picked. If his share was 18 qt., how many quarts did he pick in all?

3. Bob sold 0.5 of his 32 marbles. How many did he sell?



Problems with Decimals

Type I: Finding the product [O]

For each problem tell the example to use.

1. The sales tax on a second-hand car is 0.02 of its price. How much is the tax on the car marked $400?

2. A second-hand car that was marked $640 is now reduced 0.125 of that price. How much has it been reduced?

3. On the car marked $750, Mr. Snead made a down payment which was 0.34 of the marked price. What was the down payment on this second-hand car?

4. The price of a Puritan car one year was $1,580. The next year, a new Puritan cost 0.15 more. How much was the increase in price?

5. Sam's brother Bob has saved 0.8 of the $575 price asked for the car he wants to buy. How much has Bob saved?

[W]

Now go back and solve these type I problems.

Tell the example for finding the missing ratio factor.

6. If 46 words out of 50 are spelled right, what part of the words are right?

7. Lois blew out 7 of the 12 candles on her birthday cake. What decimal part of the candles did she blow out?

8. Arthur lost 4 of his 12 marbles. How many hundredths of his marbles did he lose?

9. Hal needs 300 ft. of kite string. He has 250 ft. What decimal part has he of the length he needs?

10. The Royals have won 11 baseball games of the 16 they have played. What decimal part of the 16 games have they won?

11. 18 is what part of 21?

12. What part of 75 is 10?

[W]

Now go back and solve these Type II problems. Give each answer as a 2-place decimal with any remainder in a common fraction.

Type III: Finding the other factor when the ratio factor is given [O]

Tell the example you will use to find the missing factor.

13. The hatchery man says that 0.80 of the eggs he sets will hatch. How many eggs must he set to get 4,000 chicks?

14. Jack found a tree that was 2 ft. thick. His father said this would be 0.32 of the distance around it. How many feet was it around the tree? (Give the answer to hundredths.)

15. Mr. Rose figures that rent should cost no more than 0.15 of his salary. At that ratio, if he pays $720 a year for rent, his salary should be at least how much?

16. 0.22 of the weight of corn is water. A sample of corn lost 1.76 lb. when dried. Before drying, it weighed _?_ lb.

17. 36 is 0.03 of _?_.

18. 0.8 of _?_ = 24.

[W]

Now go back and solve these Type III problems.

Which Kind of Decimal Problem?

Differentiating Types I, II, and III [O]

Tell which kind of problem each is, as "Type II, finding the ratio factor." Then tell the example to use.

1. One day a merchant's sales-tax collections were $19.29. If the tax was 0.03 of his sales, how much were his sales?

2. One rainy day 5 pupils out of 40 in Miss Hill's class were late. What decimal part of the class was late?

3. Yellow brass is 0.3 zinc. How many pounds of zinc are used in making 68 lb. of yellow brass?

4. Powdered egg weighs 0.14 as much as eggs in shells. How much powdered egg will 45 lb. of eggs in shells make?

5. How much must Dick earn in order to save $60 if he saves 0.30 of his earnings?

6. An oven-dressed turkey weighs 0.7 as much as it weighed when alive. What was the live weight of Mrs. Jones's turkey if it weighed 21 lb. after dressing?

[W]

Now go back and solve decimal problems 1–6.

Oral Practice

1. For 4.1 × 0.016, how many decimal places will there be in the product?

2. What 2-place decimal equals $\frac{4}{5}$? $\frac{3}{4}$? $\frac{2}{3}$?

3. In $314\overline{)11{,}034}$, what is the first partial dividend?

4. Is 0.8 × 14 more or less than 14? Why?

5. Add mentally: **a.** 42 + 16 + 20; **b.** 57 + 31 + 35.

6. Which is larger, 0.1 or 0.01?

7. Say the products: 10 × 4.1; 100 × 0.016; 42.5 × 1,000.

8. Say the quotients: 7.2 ÷ 10; 0.8 ÷ 100; 0.05 ÷ 1,000.

Practice with Decimals

[W]

Find answers for these:

	a	b	c	d	e
1.	10.3 45.8 +9.2	8.26 0.98 +1.50	72.5 36.8 +7.1	0.125 0.376 +0.058	0.019 0.036 +0.081
2.	19.2 −1.8	1.32 −0.85	0.418 −0.165	3 −2.78	17.105 −3.627
3.	13.2 ×4.8	0.023 ×15	2.65 ×1.2	4.10 ×2.53	0.0021 ×6
4.	438 ×0.02	8.15 ×0.038	0.4 ×0.5	0.03 ×0.04	7.21 ×0.07

5. Divide: **a.** 36.94 ÷ 4; **b.** 9.632 ÷ 0.32; **c.** 0.8424 ÷ 0.018; **d.** 1.65 ÷ 0.5; **e.** 936 ÷ 1.28.

6. Change to decimals (nearest thousandth): $\frac{3}{8}$; $\frac{1}{16}$; $\frac{5}{24}$.

7. Write answers only: **a.** 10 × 3.8; **b.** 0.016 × 100; **c.** 1,000 × 3.12; **d.** 7.6 ÷ 10; **e.** 97 ÷ 100.

Just to Remind You

[O]

1. The last decimal place used gives a decimal its name. Explain this for 1.46; for 3.245; and for 0.0028

2. In reading mixed decimals, how do you use "and"? To show what you mean, read: **a.** 1.25; **b.** 284.3; **c.** 7,050.02

3. What decimal part of a dollar is: 9¢? $0.37?

4. Read: 1,281,537,000.

5. In 206 × 431, how many partial products will there be?

6. In which of these will the first trial quotient be too large?
(a) $43\overline{)1{,}627}$ (b) $24\overline{)784}$ (c) $36\overline{)1{,}418}$

Using What You Have Learned

[W]

1. Divide 7 by 8. Give the quotient as a 3-place decimal.

2. Change these common fractions to decimal form:

a. $\frac{5}{10}$; **b.** $2\frac{20}{100}$; **c.** $\frac{625}{1,000}$

3. Write "sixty-four hundredths" as a common fraction in lowest terms and as a decimal.

4. Write with dollar sign and decimal point:
a. five dollars and six cents; **b.** five cents; **c.** ten cents

5. When hundredths are multiplied by tenths, the product has _?_ decimal places. 0.2 × 0.12 = ?

6. Write estimates only for the products:

a. 0.9 × 3; **b.** 6 × 4.1; **c.** 9 × 9.8

7. Round these mixed decimals to the nearest whole number:

a. 6.96; **b.** 8.21; **c.** 12.52

8. Write 0.3 and 0.54 with a common denominator.

9. Is 0.7 × 18 more or less than 18? Why?

10. Write only the answers: **a.** 10 × 2.8; **b.** 0.6 ÷ 100; **c.** 1 ÷ 100; **d.** 6.28 × 100; **e.** 0.08 × 1,000; **f.** 0.46 ÷ 1,000

11. Change $\frac{3}{16}$ to a four-place decimal.

12. To multiply a number by 100, *think* its decimal point _?_ places to the _?_.

13. Write each of these as a common fraction:

a. 0.8; **b.** 0.94; **c.** 0.059; **d.** 0.05

14. In each pair of numbers which is larger: **a.** 0.84 or 1? **b.** 3 or 2.98? **c.** 0.08 or 0.18? **d.** 0.38 or 0.0048?

15. Copy the following and put in decimal points to make products correct: **a.** 0.5 × 15 = 75; **b.** 12 × 0.26 = 312; **c.** 0.68 × 0.07 = 476; **d.** 3.103 × 2.8 = 86884

16. Divide each number by 100. Write only the quotient.

a. 8; b. 20; c. 2.7; d. 0.59; e. 12.5; f. 3.087

17. Write a. 26 as tenths; b. 41 as hundredths.

18. Write a. 34 as thousandths; b. 2 as ten-thousandths.

Division Problems

[O]

Tell the example to use in solving each problem.

1. $3.80, the cost of food for a hike, was shared equally by 10 boys. How much did each boy pay?

2. A gallon of sea water makes 0.25 lb. of salt. How many gallons will it take to make 100 lb. of salt?

3. Sue bought 10 oz. of pepper in 2.5-ounce boxes. How many boxes did she buy?

4. Our car averages 16.7 mi. per gallon of gasoline. How many gallons do we use in going 100 mi.?

5. Jack, a 4-H Club boy, raised 356.4 bu. of corn on 4.7 A., an average of _?_ bu. an acre, to the nearest tenth.

6. Sam, also a 4-H boy, has 7 bu. of seed wheat. If 1.25 bu. will seed an acre, how many acres can he plant?

7. A millimeter, a measure of length used by scientists, is about 0.04 in. How many millimeters are there in 1 ft.?

[W]

Now go back and solve problems 1–7.

Dividing with Decimals

A summary [O]

This chart shows all the kinds of examples you have been working in division with decimals. As with common fractions, some quotients tell *how many times* and some tell *what part*. Where two examples appear in a box, there is one of each kind.

For each example in the chart tell just by looking whether the quotient will be a how-many-times or a what-part-of number.

Dividend	**Divisor**		
	Whole number	Decimal fraction	Mixed decimal
Whole Number	1. 15 ÷ 6 2. 7 ÷ 8	6. 56 ÷ 0.4	10. 8 ÷ 1.15 11. 5 ÷ 25.5
Decimal Fraction	3. 0.75 ÷ 5	7. 0.85 ÷ 0.5 8. 0.5 ÷ 0.95	12. 0.2 ÷ 4.28
Mixed Decimal	4. 24.8 ÷ 8 5. 3.06 ÷ 6	9. 2.25 ÷ 0.75	13. 4.6 ÷ 1.15 14. 2.4 ÷ 19.2

[W]

1–14. Work each example in the chart. When a quotient does not end by thousandth's place, round the quotient to the nearest hundredth.

Copy and divide in rows 15–18. Round any uneven quotient to the nearest hundredth.

	a	b	c	d
15.	0.09)395.1	0.05)2,689	0.07)0.0028	1.3)2.6
16.	7)0.5572	7)0.4543	13)0.26	3.2)96
17.	0.15)1.632	8)676.8	0.4)0.284	0.24)4.8
18.	4.5)153	0.6)0.7926	12)9.6	0.04)47.6

Extra Practice. For more practice, work Sets 111–112.

Work for Young Experimenters

Supplementary activity: rules for divisibility [O]

Charlie and Ted had trouble knowing what numbers they could divide by in reducing fractions to lowest terms. Miss Pike gave them these rules to work by:

1. An even number is divisible by 2. [For example, 714].

2. If the sum of the figures in a number is divisible by 3, the number is divisible by 3. [For example, 285 is divisible by 3 because 2 + 8 + 5 = 15, which is divisible by 3.]

3. Any number ending in 0 or 5 is divisible by 5. [For example, 930 or 935]

4. If the sum of the figures in an even number is divisible by 3, the number is divisible by 6. [For example, 534 is divisible by 6 because it is an even number and 5 + 3 + 4 = 12, which is divisible by 3.]

5. If the sum of the figures in a number is divisible by 9, the number is divisible by 9. [For example, 189 is divisible by 9 because 1 + 8 + 9 = 18, which is divisible by 9.]

[W]

Copy each of the following numbers. Beside each, write first the numbers by which it can be divided and then, in parentheses, the numbers of the rules that give the reasons.

1. 82
2. 69
3. 25
4. 48
5. 72
6. 39
7. 45
8. 198
9. 275
10. 834
11. 384
12. 693
13. 914
14. 540
15. 936
16. 852
17. 642
18. 950
19. 753
20. 486
21. 185
22. 9,870
23. 1,628
24. 3,456
25. 6,294
26. 9,270
27. 5,846
28. 4,020

Extra Practice. As a review of some of the work you have had during the year, work Sets 117–127.

Finding n, the Missing Factor

M. and D. with decimals [O]

Multiplication	Division
A $\underbrace{\underset{\text{multiplier}}{0.3} \times \underset{\text{multiplicand}}{0.9}}_{\text{factors}} = \underset{\text{product}}{0.27}$	**B** $0.27 \div 0.3 = 0.9$ $\underset{\text{dividend}}{0.27} \div \underset{\text{divisor}}{0.9} = \underset{\text{quotient}}{0.3}$

1. In box A, name the factors; the product.

2. In box B, what are the two decimals which multiplied together give 0.27?

3. Then which two numbers in a division exercise may be thought of as factors? Which number, then, is a product?

4. In the multiplication exercises (box C), when **n** is either the multiplicand or the multiplier, how do we find **n**, the missing factor?

5. In the division exercises (box D), when **n** is either the divisor or the quotient, how do we find **n**?

C

$0.3 \times n = 0.27$	$n \times 0.9 = 0.27$
$n = 0.27 \div 0.3$	$n = 0.27 \div 0.9$
$n = 0.9$	$n = 0.3$

D

$0.27 \div 0.3 = n$	$0.27 \div n = 0.9$
$n = 0.27 \div 0.3$	$n = 0.27 \div 0.9$
$n = 0.9$	$n = 0.3$

6. Then in either a multiplication or a division example with decimals, what do we do to find **n**, the missing factor?

[W]

Write your work to find **n**, the missing factor, in Ex. 7–15.

7. $n \times 0.2 = 1.0$
8. $0.21 \div n = 0.7$
9. $0.24 \div 0.8 = n$
10. $0.36 \div n = 0.4$
11. $0.6 \times n = 0.24$
12. $n \times 0.5 = 0.45$
13. $0.3 \times n = 0.051$
14. $0.328 \div n = 0.8$
15. $n \times 0.5 = 0.125$

Problems without Numbers

[O]

Tell what you would do to solve these problems:

1. You know the total number of cars that passed a given spot today and the number of cars a week ago. How would you find what decimal part one total number of cars is of the other?

2. If you know the number of cars which passed the given spot each day for a week, how would you find the average number of cars a day?

3. If you know the cost of making one mile of road, how will you find the cost of making a road several miles long?

4. A ranch is in the form of a rectangle. You know its area and its length. How do you find the width of the ranch?

5. You know the fraction of a pound of fertilizer which Ann uses for her plants every two weeks. How can you tell how long a large bag of the fertilizer will last?

6. You know the distance some boys are going to cover on a hike and the number of miles an hour they average. After they have gone a certain number of miles, how can you tell about how much longer the hike will take at the same rate?

7. You know the perimeter of a square garden. How can you tell the length of one side of the garden?

HELPER. Are all sides of a square the same length?

8. You know the cost of a yard of material. How can you find the cost of a fractional part of a yard?

9. You know the cost of a yard of material. You have less than that amount of money. How would you find what fractional part of a yard you could buy?

10. You know that the number of pupils in your room is a certain decimal fraction of the number of pupils in the school. How can you find the number of pupils in the school?

Completing Unfinished Problems

[W]

Copy each exercise and write a question to make a problem.

1. Woodstock had a population of 18,064 in 1940. In 1950 the population was 1.25 times as much.

2. Dot is saving money in order to buy a bag. She saves 75¢ a week. The bag costs $8.25.

3. On a trip last summer, Mr. Ames paid $5.39 for 1 quart of oil costing 35¢ and 16.8 gallons of gasoline.

4. A pint of milk weighs about 1.07 lb. A can of the same kind of milk weighs 18.4 lb.

5. Last year Tom grew 2.4 in. and Jim grew 1.8 in.

6. Milk costs 24¢ a quart. We bought 3 quarts of milk for the picnic supper.

7. A large ship had 2,000 passengers and a crew of 1,200.

8. Some lobster fishermen started the season with 140 lobster traps. At the end of the season they had only 112.

9. A dozen eggs weigh 1 lb. 10 oz. A case which will hold 30 dozen of these eggs weighs 5 lb.

10. A truckman charged $50 for hauling a load 100 miles.

11. In a dictionary, the picture of a robin is $1\frac{1}{4}$ inches long. The scale is $\frac{1}{16}$ *in.* = *1 in.*

12. The rainfall during 4 months was as follows: May, $2\frac{1}{2}$ in.; June, 4 in.; July, $5\frac{1}{2}$ in.; August, 3 in.

13. Mr. Hanson burned 3 T. of coal during January.

14. Mrs. Avery wants to buy a piece of rug 3 yd. by $6\frac{1}{2}$ yd. The rug material sells at $14 a square yard and any fraction of a square yard is counted as 1 sq. yd.

Now solve the problems you have made.

Short Answer Test

[W]

Copy the right answer. If it is not given, write "Not given."

1. $0.3 \times 69 = ?$ 2.3; 20.7; 19.7
2. $0.4 \times 0.2 = ?$ 0.02; 0.8; 0.008
3. $7.2 \times 0.5 = ?$ 35; 3.6; 0.36
4. $6\frac{1}{2} \div 2\frac{3}{4} = ?$ $2\frac{9}{22}$; $2\frac{4}{11}$; $4\frac{8}{11}$
5. $\frac{1}{2} \div 8 = ?$ $\frac{1}{16}$; 4; $8\frac{1}{2}$
6. $\frac{3}{4} \times 3 = ?$ $1\frac{1}{2}$; $\frac{6}{23}$; $7\frac{3}{4}$
7. $8\frac{1}{4} - 2\frac{1}{3} = ?$ $5\frac{11}{12}$; $6\frac{2}{3}$; $6\frac{5}{6}$

8. $\frac{7}{8} = ?$ 0.7; 0.83
9. $\frac{3}{16} = ?$ 0.16; $0.18\frac{3}{4}$
10. $0.02 \times 42 = ?$ 2.1; 0.84
11. $\frac{1}{6} = ?$ $0.16\frac{2}{3}$; 0.60
12. $\frac{4}{25} = ?$ 0.16; 0.18
13. $0.3 \times 1.6 = ?$ 0.48; 4.8

14. If 0.6 of a number is 18, the number is _?_ 10.8; 30
15. If 0.25 of a number is 50, the number is _?_ 12.5; 200

16. $\frac{5}{6}$ of 18 = _?_ 15; 90
17. $2\frac{1}{8} + 5\frac{3}{4}$ = _?_ $7\frac{7}{8}$; $8\frac{1}{8}$
18. $\frac{3}{4}$ of 24 = _?_ 12; 18
19. $5\frac{1}{2} - 2\frac{4}{5}$ = _?_ $2\frac{7}{10}$; $2\frac{3}{5}$

Practice with Measures

[W]

	a	b	c	d
1.	8 ft. 7 in. +2 ft. 9 in.	2 hr. 45 min. +5 hr. 37 min.	5 gal. 1 qt. −3 gal. 2 qt.	8 yd. −2 yd. 2 ft.
2.	5 T. 1600 lb. ×3	2 lb. 5 oz. ×7	1 hr. 22 min. ×5	8 ft. 3 in. ×12

3. 5)2 hr. 50 min.
4. 6)8 T. 200 lb.
5. 3)2 gal. 1 qt.

6. In what century is the year 1805? 1900? 1901? 2001?

A Short Way to Divide

Even division **[O]**

1. Jack has found that in even division, like $3\overline{)693}$, he doesn't have to write all the steps, as in box A. He just thinks the steps, and his work looks like that in box B. This way of dividing is called **short division.** Explain the division in box B.

A

$$\begin{array}{r} 231 \\ 3\overline{)693} \\ \underline{6} \\ 9 \\ \underline{9} \\ 3 \\ \underline{3} \end{array}$$

At the board, work Ex. 2–9 by short division.

2. $2\overline{)84}$ **3.** $3\overline{)36}$ **4.** $4\overline{)48}$ **5.** $2\overline{)246}$

6. $4\overline{)408}$ **7.** $7\overline{)217}$ **8.** $\frac{1}{6}$ of 240 **9.** $\frac{1}{3}$ of 279

Uneven D.; one-place quotient

Short division is no different from long division, except that more work is done mentally; that is, without writing everything down.

B

$$\begin{array}{r} 231 \\ 3\overline{)693} \end{array}$$

10. We can divide any whole number or decimal by a one-place divisor without writing all the steps.

For Ex. C, in our minds we separate 25 into 21 and the remainder, 4. The 21 is the product of three 7's. Why is 21 the **table number** for $7\overline{)25}$?

C

$$\begin{array}{r} 3\frac{4}{7} \\ 7\overline{)25} \end{array}$$

The other part of 25 is $25 - 21$, or _?_. So we see that $7\overline{)25} = 7\overline{)21} + 7\overline{)4}$, or $3\frac{4}{7}$. The answer may also be 3, R4.

Without pencil and paper tell the quotients, as in box C.

	a	b	c	d	e	f	g
11.	$5\overline{)24}$	$3\overline{)17}$	$9\overline{)14}$	$6\overline{)33}$	$7\overline{)48}$	$6\overline{)58}$	$7\overline{)59}$
12.	$4\overline{)33}$	$7\overline{)46}$	$5\overline{)32}$	$9\overline{)47}$	$7\overline{)36}$	$6\overline{)49}$	$7\overline{)47}$
13.	$9\overline{)76}$	$9\overline{)38}$	$8\overline{)57}$	$7\overline{)26}$	$9\overline{)79}$	$8\overline{)59}$	$7\overline{)65}$
14.	$9\overline{)49}$	$9\overline{)58}$	$8\overline{)58}$	$9\overline{)64}$	$4\overline{)39}$	$8\overline{)73}$	$8\overline{)49}$
15.	$6\overline{)45}$	$7\overline{)58}$	$8\overline{)67}$	$6\overline{)44}$	$7\overline{)39}$	$8\overline{)27}$	$6\overline{)56}$
16.	$8\overline{)76}$	$8\overline{)42}$	$9\overline{)28}$	$7\overline{)66}$	$9\overline{)29}$	$6\overline{)57}$	$6\overline{)29}$

17. How many pecks are in 307 quarts? How many quarts are left over?

Why is 30 (tens) the first partial dividend in this example?

Why is 24 the table number for $8\overline{)30}$?

Why is 6, the first remainder, 6 tens?

In long division the 6 tens and the 7 ones (box D), are added by bringing down the 7. In short division (box E), the 6 tens are added to the 7 ones by carrying the 6, that is, holding it in mind and mentally putting it with the 7.

What is the table number for $8\overline{)67}$?

307 quarts = 38 pecks _?_ quarts.

18. Explain Ex. F and the check.

19. In Ex. G, 18 tens ÷ 6 = 3 tens.

Since there are no 6's in 5, we write _?_ in the quotient in one's place and show the remainder in a fraction, as 5 divided by _?_.

> **After the first quotient figure, there must be a figure in the quotient for every remaining figure in the dividend.**

D

$$\begin{array}{r} 38\text{, R3} \\ 8\overline{)307} \\ \underline{24} \\ 67 \\ \underline{64} \\ 3 \end{array}$$

E

$$\begin{array}{r} 3\;8\text{, R3} \\ 8\overline{)3\;0\;7} \end{array}$$

F

$$\begin{array}{r} 8\;4\tfrac{3}{5} \\ 5\overline{)4\;2\;3} \end{array}$$

Check

$$\begin{array}{r} 84 \\ \underline{\times 5} \\ 420 \\ \underline{+3} \\ 423 \end{array}$$

G

$$\begin{array}{r} 3\;0\tfrac{5}{6} \\ 6\overline{)1\;8\;5} \end{array}$$

[W]

Copy these examples and work them by short division. Show any remainder in a fraction. Check your answers for row 23.

	a	b	c	d	e	f
20.	$3\overline{)72}$	$5\overline{)270}$	$2\overline{)67}$	$4\overline{)96}$	$6\overline{)156}$	$8\overline{)368}$
21.	$7\overline{)142}$	$6\overline{)285}$	$4\overline{)123}$	$9\overline{)460}$	$7\overline{)374}$	$5\overline{)371}$
22.	$3\overline{)127}$	$8\overline{)187}$	$6\overline{)384}$	$7\overline{)235}$	$4\overline{)162}$	$9\overline{)947}$
23.	$3\overline{)90}$	$8\overline{)258}$	$7\overline{)295}$	$5\overline{)408}$	$5\overline{)162}$	$9\overline{)736}$

▶ **Extra Practice.** For more practice, work Sets 113, 114, 116.

Short Division

Harder subtraction [O]

In division, whether long or short, there is a partial dividend for each quotient figure. In short division, at each partial dividend, you do three important things in your mind:

A

$$\begin{array}{r} 6\,4\frac{5}{8} \\ 8\overline{)5\,1\,7} \end{array}$$

a. You *think* the table number for the partial dividend.
b. You *think* the remainder (partial dividend minus table number).
c. You carry the remainder to the next figure in the dividend, getting the next partial dividend.

Say the table number and the remainder for each of these. For the first example say, "28, remainder 3."

	a	b	c	d	e	f
1.	4)31	3)20	6)22	4)11	9)23	7)31
2.	9)33	7)13	8)22	6)40	8)31	9)51
3.	8)52	9)42	7)20	9)61	6)51	9)71

The following subtractions will help you in working short division. Say the remainders.

	a	b	c	d	e
4.	21 − 18	41 − 36	52 − 48	53 − 49	22 − 16
5.	33 − 28	55 − 49	61 − 56	30 − 24	32 − 28
6.	31 − 27	53 − 48	73 − 64	80 − 72	90 − 81

2- and 3-place quotients

For these short-division examples with two partial dividends, tell quotients and give remainders with R.

	a	b	c	d	e	f
7.	5)180	3)110	6)213	4)151	9)295	5)203
8.	7)514	6)432	8)705	4)71	8)663	6)525
9.	9)723	7)370	6)221	8)524	9)535	7)552
10.	9)264	6)512	7)333	8)304	9)313	7)325

Short division can be used with larger dividends and with decimals.

B

$$\begin{array}{r} 289\tfrac{1}{2} \\ 8\overline{)2{,}316} \end{array}$$

C

$6.26 \div 4 = ?$

$$\begin{array}{r} 1.565 \\ 4\overline{)6.260} \end{array}$$

D

$421 \div 0.7 = ?$

(to nearest hundredth)

$$\begin{array}{r} 601.428 \\ 7\overline{)4{,}210.000} \end{array}$$

Ans., 601.43,
to nearest hundredth

11. For Ex. B, what are the 3 partial dividends? Explain the division.

12. In Ex. C, why is a 0 written after 6.26? Explain the division.

13. In Ex. D, before dividing, why do we multiply 421 and 0.7 by 10? Why do we write 0's in tenth's, hundredth's, and thousandth's places in the dividend? Explain the work.

[W]

Copy and divide, using short division. If uneven, round the quotient to the nearest tenth.

	a	b	c	d
14.	$7\overline{)3{,}129}$	$9\overline{)4{,}356}$	$4\overline{)5.24}$	$5\overline{)\$62.80}$
15.	$0.6\overline{)7.86}$	$8\overline{)940}$	$7\overline{)9.15}$	$0.04\overline{)96.2}$
16.	$3\overline{)7{,}461}$	$9\overline{)3.84}$	$6\overline{)5.407}$	$0.2\overline{)810}$
17.	$8\overline{)928}$	$7\overline{)3{,}671}$	$6\overline{)843}$	$0.5\overline{)8.25}$

18. Change to whole or to mixed numbers. Use short division.

a. $\frac{244}{7}$ **b.** $\frac{125}{5}$ **c.** $\frac{208}{4}$ **d.** $\frac{121}{8}$ **e.** $\frac{95}{6}$

Use short division and change to decimals, rounding to the nearest hundredth.

	a	b	c	d	e	f
19.	$\frac{7}{8}$	$\frac{5}{9}$	$\frac{3}{4}$	$\frac{2}{3}$	$\frac{5}{6}$	$\frac{8}{9}$
20.	$\frac{4}{5}$	$\frac{3}{7}$	$\frac{1}{6}$	$\frac{2}{9}$	$\frac{10}{7}$	$\frac{13}{5}$
21.	$2\frac{1}{4}$	$3\frac{1}{9}$	$1\frac{5}{7}$	$6\frac{1}{2}$	$8\frac{2}{5}$	$10\frac{1}{3}$

Extra Practice. For more practice, work Set 115.

Do You Understand?

Test of Information and Meaning 7

1. How do you think of moving the decimal point to get the product of

a. 100×4.1?   b. 10×0.6?   c. $1{,}000 \times 6.1$?

2. How can you change any common fraction to a decimal fraction if you do not know the equivalent decimal?

3. For a decimal fraction with four figures at the right of the decimal point, what is the fractional unit?

4. Work the following division by using common fractions:

$$0.5\overline{)1.25}$$

5. If the remainder in Ex. A is to be shown in a decimal fraction in the quotient, what must you do next?

6. When the divisor is a mixed decimal, as in $1.4\overline{)42}$, how must you change the example before you divide?

7. How would you check the quotient in Ex. B?

8. Does the fraction $\frac{7}{8}$ equal the decimal 0.75?

9. Does $5\frac{1}{4} = 5.4$?

A

$$\begin{array}{r} 4 \\ 8\overline{)33} \\ \underline{32} \\ 1 \end{array}$$

B

$$\begin{array}{r} 0.3 \\ 2\overline{)0.6} \\ \underline{6} \end{array}$$

10. If you multiply both the divisor and the dividend of a division example by 100, have you changed the quotient?

11. When you want to express a quotient to the nearest hundredth, how many decimal places must you first get in the quotient?

12. Give the decimal equivalent for each of the following:

a. $\frac{1}{3}$ b. $\frac{7}{8}$ c. $\frac{2}{5}$ d. $\frac{1}{2}$ e. $\frac{3}{4}$ f. $\frac{1}{6}$ g. $\frac{1}{4}$

13. How do you think of moving the decimal point to get the quotient for

a. $70.6 \div 10$?   b. $75 \div 1{,}000$?   c. $0.2 \div 100$?

Can You Solve Problems?

Problem Test 7

1. The distance around the park is 1.2 miles. In 8 trips around the park, how far has Frank ridden his bicycle?

2. The four men on a 1-mile relay track team ran in the following times: 48.6 sec., 47.3 sec., 47.2 sec., and 46.9 sec. What was their average time?

3. The cost of gasoline for a motor scooter was 25.6 cents for 42 miles. What was the cost per mile to the nearest tenth of a cent?

4. A road-building crew averages 0.6 of a mile per day. At that rate, how long will it take the crew to build 12 mi. of road?

5. At 22.8 miles per hour how many miles can a tractor travel in one day of 7 hours?

6. The cost of passenger air transportation for one aviation company was $0.0506 per passenger mile. On an average day, planes of that company carried passengers 60,000 passenger miles. What was the average daily cost of carrying passengers?

7. The wool in the average suit of clothes weighs $2\frac{1}{2}$ pounds. If the washed wool in cloth is only 0.4 of the weight of wool as it comes from the sheep, what was the original weight of the wool used in a suit of clothes?

8. When wool is washed, it loses about 0.6 of its original weight. How many pounds of washed wool will be obtained from 220 pounds of greasy wool?

9. Make up one of each of the following kinds of problems with decimals:

I. You must find a product;
II. You must find the ratio factor;
III. You must find the other factor when the ratio factor is given.

Do You Make Mistakes?

Diagnostic Test 7

		Study Pages	Practice Sets
1.	Write the equivalent decimal for **a.** $\frac{3}{4}$; **b.** $\frac{7}{8}$; **c.** $\frac{1}{4}$; **d.** $\frac{4}{5}$; **e.** $\frac{7}{10}$; **f.** $\frac{1}{2}$	258–261	91
2.	Round any uneven decimal to the nearest hundredth. a $8\overline{)15}$ b $6\overline{)17}$ c $25\overline{)8}$ d $32\overline{)5}$ e $45\overline{)6}$	257–259	102
3.	Change to an equivalent decimal rounded to hundredths. $\frac{2}{9}$ $\frac{3}{7}$ $\frac{3}{14}$ $\frac{2}{11}$ $\frac{5}{17}$	258–259	103
4.	**a.** $5\overline{)0.75}$ **b.** $9\overline{)1.899}$ **c.** $4\overline{)24.8}$ **d.** $15\overline{)0.45}$ **e.** $25\overline{)2.75}$	262–263	104, 105
5.	Round uneven quotients to the nearest hundredth. **a.** $0.7\overline{)0.98}$ **b.** $0.6\overline{)3.36}$ **c.** $2.4\overline{)0.768}$ **d.** $1.6\overline{)498}$ **e.** $1.4\overline{)379}$	267–269	107–112
6.	Use short division for these: **a.** $7\overline{)185}$ **b.** $\frac{325}{8}$ **c.** $9.2 \div 4$	284–287	113–116

How Well Can You Figure?

Computation Test 7

Divide. Round uneven quotients to nearest hundredth.

1. $17\overline{)38}$
2. $9\overline{)7}$
3. $4\overline{)1.29}$
4. $0.8\overline{)425}$
5. $25\overline{)86}$
6. $11\overline{)4.62}$
7. $45\overline{)92.87}$
8. $5.2\overline{)1.097}$
9. $0.5\overline{)0.045}$
10. $3.4\overline{)695}$
11. $0.3\overline{)197.82}$
12. $6.7\overline{)14.632}$

The 81 Addition Facts

Sums through 18

1	1	1	1	1	1	1	1	1
+1	+2	+3	+4	+5	+6	+7	+8	+9
2	3	4	5	6	7	8	9	10
2	2	2	2	2	2	2	2	2
+1	+2	+3	+4	+5	+6	+7	+8	+9
3	4	5	6	7	8	9	10	11
3	3	3	3	3	3	3	3	3
+1	+2	+3	+4	+5	+6	+7	+8	+9
4	5	6	7	8	9	10	11	12
4	4	4	4	4	4	4	4	4
+1	+2	+3	+4	+5	+6	+7	+8	+9
5	6	7	8	9	10	11	12	13
5	5	5	5	5	5	5	5	5
+1	+2	+3	+4	+5	+6	+7	+8	+9
6	7	8	9	10	11	12	13	14
6	6	6	6	6	6	6	6	6
+1	+2	+3	+4	+5	+6	+7	+8	+9
7	8	9	10	11	12	13	14	15
7	7	7	7	7	7	7	7	7
+1	+2	+3	+4	+5	+6	+7	+8	+9
8	9	10	11	12	13	14	15	16
8	8	8	8	8	8	8	8	8
+1	+2	+3	+4	+5	+6	+7	+8	+9
9	10	11	12	13	14	15	16	17
9	9	9	9	9	9	9	9	9
+1	+2	+3	+4	+5	+6	+7	+8	+9
10	11	12	13	14	15	16	17	18

The 81 Subtraction Facts

Minuends through 18

2	3	4	5	6	7	8	9	10
−1	−1	−1	−1	−1	−1	−1	−1	−1
1	2	3	4	5	6	7	8	9
3	4	5	6	7	8	9	10	11
−2	−2	−2	−2	−2	−2	−2	−2	−2
1	2	3	4	5	6	7	8	9
4	5	6	7	8	9	10	11	12
−3	−3	−3	−3	−3	−3	−3	−3	−3
1	2	3	4	5	6	7	8	9
5	6	7	8	9	10	11	12	13
−4	−4	−4	−4	−4	−4	−4	−4	−4
1	2	3	4	5	6	7	8	9
6	7	8	9	10	11	12	13	14
−5	−5	−5	−5	−5	−5	−5	−5	−5
1	2	3	4	5	6	7	8	9
7	8	9	10	11	12	13	14	15
−6	−6	−6	−6	−6	−6	−6	−6	−6
1	2	3	4	5	6	7	8	9
8	9	10	11	12	13	14	15	16
−7	−7	−7	−7	−7	−7	−7	−7	−7
1	2	3	4	5	6	7	8	9
9	10	11	12	13	14	15	16	17
−8	−8	−8	−8	−8	−8	−8	−8	−8
1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
−9	−9	−9	−9	−9	−9	−9	−9	−9
1	2	3	4	5	6	7	8	9

The 81 Multiplication Facts

Through 9 × 9

$$\begin{array}{rrrrrrrrr} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ \times 1 & \times 1 & \times 1 & \times 1 & \times 1 & \times 1 & \times 1 & \times 1 & \times 1 \\ \hline 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \end{array}$$

$$\begin{array}{rrrrrrrrr} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ \times 2 & \times 2 & \times 2 & \times 2 & \times 2 & \times 2 & \times 2 & \times 2 & \times 2 \\ \hline 2 & 4 & 6 & 8 & 10 & 12 & 14 & 16 & 18 \end{array}$$

$$\begin{array}{rrrrrrrrr} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ \times 3 & \times 3 & \times 3 & \times 3 & \times 3 & \times 3 & \times 3 & \times 3 & \times 3 \\ \hline 3 & 6 & 9 & 12 & 15 & 18 & 21 & 24 & 27 \end{array}$$

$$\begin{array}{rrrrrrrrr} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ \times 4 & \times 4 & \times 4 & \times 4 & \times 4 & \times 4 & \times 4 & \times 4 & \times 4 \\ \hline 4 & 8 & 12 & 16 & 20 & 24 & 28 & 32 & 36 \end{array}$$

$$\begin{array}{rrrrrrrrr} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ \times 5 & \times 5 & \times 5 & \times 5 & \times 5 & \times 5 & \times 5 & \times 5 & \times 5 \\ \hline 5 & 10 & 15 & 20 & 25 & 30 & 35 & 40 & 45 \end{array}$$

$$\begin{array}{rrrrrrrrr} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ \times 6 & \times 6 & \times 6 & \times 6 & \times 6 & \times 6 & \times 6 & \times 6 & \times 6 \\ \hline 6 & 12 & 18 & 24 & 30 & 36 & 42 & 48 & 54 \end{array}$$

$$\begin{array}{rrrrrrrrr} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ \times 7 & \times 7 & \times 7 & \times 7 & \times 7 & \times 7 & \times 7 & \times 7 & \times 7 \\ \hline 7 & 14 & 21 & 28 & 35 & 42 & 49 & 56 & 63 \end{array}$$

$$\begin{array}{rrrrrrrrr} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ \times 8 & \times 8 & \times 8 & \times 8 & \times 8 & \times 8 & \times 8 & \times 8 & \times 8 \\ \hline 8 & 16 & 24 & 32 & 40 & 48 & 56 & 64 & 72 \end{array}$$

$$\begin{array}{rrrrrrrrr} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ \times 9 & \times 9 & \times 9 & \times 9 & \times 9 & \times 9 & \times 9 & \times 9 & \times 9 \\ \hline 9 & 18 & 27 & 36 & 45 & 54 & 63 & 72 & 81 \end{array}$$

The 81 Division Facts

Through 81 ÷ 9

$\begin{array}{r}1\\ 1\overline{)1}\end{array}$	$\begin{array}{r}2\\ 1\overline{)2}\end{array}$	$\begin{array}{r}3\\ 1\overline{)3}\end{array}$	$\begin{array}{r}4\\ 1\overline{)4}\end{array}$	$\begin{array}{r}5\\ 1\overline{)5}\end{array}$	$\begin{array}{r}6\\ 1\overline{)6}\end{array}$	$\begin{array}{r}7\\ 1\overline{)7}\end{array}$	$\begin{array}{r}8\\ 1\overline{)8}\end{array}$	$\begin{array}{r}9\\ 1\overline{)9}\end{array}$
$\begin{array}{r}1\\ 2\overline{)2}\end{array}$	$\begin{array}{r}2\\ 2\overline{)4}\end{array}$	$\begin{array}{r}3\\ 2\overline{)6}\end{array}$	$\begin{array}{r}4\\ 2\overline{)8}\end{array}$	$\begin{array}{r}5\\ 2\overline{)10}\end{array}$	$\begin{array}{r}6\\ 2\overline{)12}\end{array}$	$\begin{array}{r}7\\ 2\overline{)14}\end{array}$	$\begin{array}{r}8\\ 2\overline{)16}\end{array}$	$\begin{array}{r}9\\ 2\overline{)18}\end{array}$
$\begin{array}{r}1\\ 3\overline{)3}\end{array}$	$\begin{array}{r}2\\ 3\overline{)6}\end{array}$	$\begin{array}{r}3\\ 3\overline{)9}\end{array}$	$\begin{array}{r}4\\ 3\overline{)12}\end{array}$	$\begin{array}{r}5\\ 3\overline{)15}\end{array}$	$\begin{array}{r}6\\ 3\overline{)18}\end{array}$	$\begin{array}{r}7\\ 3\overline{)21}\end{array}$	$\begin{array}{r}8\\ 3\overline{)24}\end{array}$	$\begin{array}{r}9\\ 3\overline{)27}\end{array}$
$\begin{array}{r}1\\ 4\overline{)4}\end{array}$	$\begin{array}{r}2\\ 4\overline{)8}\end{array}$	$\begin{array}{r}3\\ 4\overline{)12}\end{array}$	$\begin{array}{r}4\\ 4\overline{)16}\end{array}$	$\begin{array}{r}5\\ 4\overline{)20}\end{array}$	$\begin{array}{r}6\\ 4\overline{)24}\end{array}$	$\begin{array}{r}7\\ 4\overline{)28}\end{array}$	$\begin{array}{r}8\\ 4\overline{)32}\end{array}$	$\begin{array}{r}9\\ 4\overline{)36}\end{array}$
$\begin{array}{r}1\\ 5\overline{)5}\end{array}$	$\begin{array}{r}2\\ 5\overline{)10}\end{array}$	$\begin{array}{r}3\\ 5\overline{)15}\end{array}$	$\begin{array}{r}4\\ 5\overline{)20}\end{array}$	$\begin{array}{r}5\\ 5\overline{)25}\end{array}$	$\begin{array}{r}6\\ 5\overline{)30}\end{array}$	$\begin{array}{r}7\\ 5\overline{)35}\end{array}$	$\begin{array}{r}8\\ 5\overline{)40}\end{array}$	$\begin{array}{r}9\\ 5\overline{)45}\end{array}$
$\begin{array}{r}1\\ 6\overline{)6}\end{array}$	$\begin{array}{r}2\\ 6\overline{)12}\end{array}$	$\begin{array}{r}3\\ 6\overline{)18}\end{array}$	$\begin{array}{r}4\\ 6\overline{)24}\end{array}$	$\begin{array}{r}5\\ 6\overline{)30}\end{array}$	$\begin{array}{r}6\\ 6\overline{)36}\end{array}$	$\begin{array}{r}7\\ 6\overline{)42}\end{array}$	$\begin{array}{r}8\\ 6\overline{)48}\end{array}$	$\begin{array}{r}9\\ 6\overline{)54}\end{array}$
$\begin{array}{r}1\\ 7\overline{)7}\end{array}$	$\begin{array}{r}2\\ 7\overline{)14}\end{array}$	$\begin{array}{r}3\\ 7\overline{)21}\end{array}$	$\begin{array}{r}4\\ 7\overline{)28}\end{array}$	$\begin{array}{r}5\\ 7\overline{)35}\end{array}$	$\begin{array}{r}6\\ 7\overline{)42}\end{array}$	$\begin{array}{r}7\\ 7\overline{)49}\end{array}$	$\begin{array}{r}8\\ 7\overline{)56}\end{array}$	$\begin{array}{r}9\\ 7\overline{)63}\end{array}$
$\begin{array}{r}1\\ 8\overline{)8}\end{array}$	$\begin{array}{r}2\\ 8\overline{)16}\end{array}$	$\begin{array}{r}3\\ 8\overline{)24}\end{array}$	$\begin{array}{r}4\\ 8\overline{)32}\end{array}$	$\begin{array}{r}5\\ 8\overline{)40}\end{array}$	$\begin{array}{r}6\\ 8\overline{)48}\end{array}$	$\begin{array}{r}7\\ 8\overline{)56}\end{array}$	$\begin{array}{r}8\\ 8\overline{)64}\end{array}$	$\begin{array}{r}9\\ 8\overline{)72}\end{array}$
$\begin{array}{r}1\\ 9\overline{)9}\end{array}$	$\begin{array}{r}2\\ 9\overline{)18}\end{array}$	$\begin{array}{r}3\\ 9\overline{)27}\end{array}$	$\begin{array}{r}4\\ 9\overline{)36}\end{array}$	$\begin{array}{r}5\\ 9\overline{)45}\end{array}$	$\begin{array}{r}6\\ 9\overline{)54}\end{array}$	$\begin{array}{r}7\\ 9\overline{)63}\end{array}$	$\begin{array}{r}8\\ 9\overline{)72}\end{array}$	$\begin{array}{r}9\\ 9\overline{)81}\end{array}$

Extra Practice

		a	b	c	d	e	f	g	h	i	j
Set 1	**1.**	16 +3	5 +50	64 +4	42 +3	21 +4	67 +2	5 +84	3 +21	85 +3	41 +2
	2.	43 +5	2 +31	35 +2	4 +73	51 +6	62 +5	16 +2	3 +23	11 +7	4 +15
	3.	74 +1	3 +12	3 +36	22 +7	10 +6	3 +94	4 +22	1 +18	82 +6	54 +4
Set 2	**1.**	59 +5	8 +47	16 +5	8 +23	69 +9	84 +8	3 +37	56 +8	77 +4	2 +19
	2.	46 +7	18 +9	39 +4	6 +59	58 +6	79 +3	7 +26	75 +7	14 +6	45 +8
	3.	38 +5	6 +36	65 +9	87 +7	17 +9	7 +28	49 +2	19 +7	67 +5	9 +86

		a	b	c	d	e	f	g	h	i	j	k	l	m
Set 3	**1.**	8 7 +6	7 4 +9	9 3 +8	6 5 +9	8 5 +7	6 6 +9	8 6 +7	6 7 +8	6 9 +8	9 8 +8	8 9 +6	9 5 +6	7 9 +4
	2.	7 7 +8	9 6 +9	9 9 +3	9 4 +9	8 4 +8	7 5 +9	4 9 +8	9 7 +7	5 7 +9	8 6 +9	7 8 +8	9 9 +7	7 6 +9
Set 4		5 6 9 +9	7 6 9 +8	9 7 8 8 +9	7 9 9 8 +8	8 8 7 +7	9 9 9 8 +7	9 8 9 9 +7	8 7 9 +6	9 6 6 +9	8 9 9 9 8 +8	8 8 5 +9	9 9 6 9 9 +8	9 7 8 8 +9

		a	b	c	d	e	f	g
Set 5	1.	41 +18	76 +23	34 +65	22 62 +2	25 10 +54	64 12 +22	15 11 +83
	2.	453 303 +22	332 245 +301	213 132 +312	4,522 +4,134	2,311 71 +7,616	1,352 6,135 +401	4,150 5,241 +504
Set 6		12 24 42 +11	24 22 30 +23	23 31 14 +40	921 203 51 +2	113 310 512 +63	1,431 6,030 5,335 +201	2,010 4,113 1,235 +4,641
Set 7	1.	85 +95	67 +56	67 +95	926 +95	618 +896	357 +883	9,419 +986
	2.	54 21 +58	242 732 +36	363 312 +406	8,784 +4,979	3,856 +7,867	2,351 4,430 +2,829	8,673 1,703 +6,699
Set 8	1.	31 52 33 +64	43 25 24 +97	69 81 97 +35	68 32 95 +41	160 943 83 +78	654 30 751 +49	172 254 762 +23
	2.	431 420 813 +196	724 904 861 +354	827 684 758 +866	4,513 9,754 267 +755	9,218 2,370 567 +9,068	1,148 9,386 9,989 +4,579	5,085 8,375 7,668 +9,737

		a	b	c	d	e	f	g	h	i	j
Set 9	**1.**	94 −4	76 −3	69 −25	52 −31	28 −7	86 −80	37 −4	19 −13	97 −70	57 −6
	2.	74 −13	89 −6	97 −97	83 −31	36 −16	49 −20	81 −30	65 −12	72 −32	53 −13
	3.	38 −24	45 −14	98 −42	68 −55	79 −51	99 −52	37 −2	56 −54	98 −86	88 −10

Set 10	**1.**	21 −4	13 −5	96 −8	22 −7	54 −9	30 −8	47 −9	65 −6	88 −9	32 −23
	2.	44 −26	71 −69	56 −47	66 −39	90 −13	84 −57	61 −16	75 −37	92 −36	20 −16
	3.	94 −85	77 −48	81 −25	65 −59	92 −48	53 −26	81 −77	50 −14	33 −17	85 −48
	4.	82 −19	91 −78	42 −34	93 −59	64 −48	81 −32	73 −28	92 −65	71 −53	93 −24

		a	b	c	d	e	f	g	h
Set 11	**1.**	432 −12	641 −20	397 −42	258 −24	796 −31	854 −23	595 −63	978 −55
	2.	859 −351	737 −623	974 −534	678 −612	945 −214	898 −776	756 −415	869 −848
	3.	812 −211	573 −573	398 −196	907 −506	674 −230	846 −815	631 −420	459 −338

		a	b	c	d	e	f	g	h
Set 12	**1.**	580 −84	745 −66	535 −97	640 −89	121 −95	920 −47	603 −98	894 −97
	2.	212 −88	347 −259	274 −187	451 −368	764 −485	636 −577	222 −173	984 −797
	3.	855 −689	931 −643	873 −494	700 −308	321 −123	733 −669	500 −486	452 −295

		a	b	c	d	e
Set 13	**1.**	550 −431	2,734 −742	8,357 −3,365	98,765 −86,444	12,381 −3,582
	2.	65,345 −7,667	7,998 −2,722	96,822 −8,967	75,442 −65,578	8,895 −4,845
	3.	976 −372	12,455 −8,888	985 −632	32,033 −9,999	6,318 −3,475
	4.	7,106 −499	31,076 −5,328	4,904 −3,956	805 −689	9,151 −298

Set 14	**1.**	$0.26 +0.76	$4.68 −0.65	$0.98 +3.47	$1.54 +8.57	$5.84 +7.48
	2.	$18.75 −3.75	$54.55 −47.96	$46.79 −9.92	$27.89 +42.96	$236.75 −95.88
	3.	$5.67 5.56 +0.87	$9.86 0.86 +9.87	$0.35 7.78 +3.52	$5.46 5.78 +0.68	$71.28 81.97 +9.36
	4.	$2.36 9.53 +8.65	$7.69 4.31 +0.76	$26.25 42.54 +7.64	$36.28 68.93 +52.95	$857.90 847.98 +48.56

		a	b	c	d	e
Set 15	**1.**	872 381 +758	604 749 +595	9,421 −7,899	6,385 −5,776	78,568 +78,762
	2.	544 878 736 +867	629 423 665 922 +816	82,325 −36,695	4,738 4,544 8,646 +9,948	9,759 6,235 3,394 1,361 +139

		a	b	c	d	e	f	g	h	i
Set 16	**1.**	34 ×2	16 ×3	35 ×4	48 ×6	72 ×4	81 ×9	53 ×8	97 ×6	72 ×7
	2.	59 ×3	68 ×2	36 ×6	71 ×5	65 ×7	52 ×2	74 ×9	89 ×4	62 ×9
	3.	31 ×2	86 ×5	73 ×3	35 ×9	68 ×8	46 ×4	71 ×8	18 ×7	35 ×5

		a	b	c	d	e	f	g
Set 17	**1.**	623 ×4	$0.75 ×6	$1.98 ×3	6,314 ×2	$4.75 ×3	9,425 ×5	$0.48 ×6
	2.	$0.87 ×8	$3.45 ×7	8,475 ×4	$52.69 ×8	2,574 ×9	$0.96 ×6	$27.89 ×7
	3.	$7.98 ×2	6,387 ×5	$0.34 ×8	$3.98 ×9	3,285 ×6	$8.16 ×7	546 ×9

Set 18

	a	b	c	d	e	f	g	h	i
1.	45 ×27	38 ×14	52 ×38	79 ×59	46 ×86	38 ×24	93 ×87	72 ×28	36 ×36
2.	74 ×24	95 ×12	79 ×36	62 ×75	54 ×43	48 ×37	63 ×29	75 ×47	58 ×95
3.	29 ×24	58 ×56	27 ×16	76 ×79	95 ×12	79 ×16	37 ×35	68 ×25	42 ×59

Set 19

	a	b	c	d	e	f	g
1.	$4.75 ×35	368 ×24	$12.98 ×16	756 ×67	2,149 ×34	984 ×78	638 ×53
2.	1,752 ×48	$79.25 ×29	1,468 ×69	$2.19 ×75	357 ×47	635 ×98	4,832 ×16
3.	468 ×75	2,579 ×83	$3.75 ×65	$46.98 ×24	$8.63 ×18	1,368 ×39	$7.35 ×27

Set 20

	a	b	c	d	e	f
1.	475 ×123	64 ×527	42 ×876	386 ×648	3,589 ×957	64 ×918
2.	18 ×491	438 ×365	64 ×914	45 ×934	97 ×849	647 ×579
3.	6,389 ×238	325 ×327	2,167 ×579	2,196 ×236	752 ×386	92 ×523

Set 21

	a	b	c	d	e	f
1.	36 ×468	579 ×312	$32.50 ×645	1,023 ×273	$0.59 ×527	$35.97 ×170
2.	8,641 ×185	127 ×608	$8.64 ×397	$0.94 ×179	468 ×204	3,690 ×698
3.	5,280 ×124	1,728 ×605	90 ×345	369 ×285	1,056 ×637	2,479 ×837

Set 22

1.	375 ×142	8,064 ×253	$0.68 ×957	6,802 ×407	914 ×174	3,824 ×806
2.	$75.39 ×305	$0.97 ×793	8,542 ×139	106 ×316	$73.90 ×812	$0.52 ×921
3.	1,695 ×490	4,071 ×507	$0.79 ×289	356 ×257	$0.89 ×601	3,407 ×649

Set 23

Show any remainder with R.

	a	b	c	d	e
1.	2)68	976 ÷ 4	3)728	$8.16 ÷ 8	6)86
2.	5)$1.75	7)815	630 ÷ 9	6)342	307 ÷ 7
3.	58 ÷ 4	3)564	5)248	934 ÷ 8	9)120
4.	2)409	214 ÷ 4	479 ÷ 9	2)213	572 ÷ 8
5.	319 ÷ 3	6)901	5)693	246 ÷ 7	5)$3.90

Set 24

Show any remainder with R.

	a	b	c	d	e
1.	3)6,729	2)1,095	3)80,976	2)40,690	4)5,376
2.	4)94,218	7)9,450	5)5,098	8)42,017	6)34,857
3.	6)16,029	3)53,421	7)7,645	2)21,873	8)48,563
4.	9)24,120	5)7,250	8)95,439	6)8,351	4)6,708
5.	7)12,376	9)8,037	5)21,346	9)93,675	7)88,019

Set 25

Show any remainder with R.

1.	21)109	33)265	60)$5.40	83)$5.81	22)158
2.	35)106	63)345	84)786	23)139	40)398
3.	67)$5.36	30)264	42)$2.52	87)719	68)408
4.	92)896	31)$2.79	45)275	73)699	98)882
5.	32)$1.92	79)348	52)416	57)290	94)376
6.	75)745	20)$1.80	49)119	85)395	77)543

Set 26

Show any remainder with R.

1.	33)96	42)250	83)566	24)88	82)402
2.	38)266	25)85	68)$5.44	26)76	52)458
3.	84)576	93)455	74)584	92)826	86)400
4.	39)91	23)219	37)159	46)$3.66	54)502
5.	35)$2.45	45)285	32)250	78)232	58)$5.22
6.	75)495	56)$5.04	34)98	64)300	96)854

Set 27

Show any remainder with R.

	a	b	c	d	e
1.	$13\overline{)101}$	$24\overline{)220}$	$58\overline{)461}$	$87\overline{)808}$	$94\overline{)372}$
2.	$26\overline{)199}$	$45\overline{)400}$	$19\overline{)121}$	$37\overline{)254}$	$76\overline{)364}$
3.	$49\overline{)251}$	$38\overline{)212}$	$62\overline{)482}$	$85\overline{)655}$	$29\overline{)201}$
4.	$17\overline{)\$1.19}$	$53\overline{)529}$	$15\overline{)\$1.20}$	$93\overline{)826}$	$72\overline{)566}$
5.	$34\overline{)180}$	$71\overline{)636}$	$82\overline{)326}$	$16\overline{)118}$	$69\overline{)\$4.83}$
6.	$96\overline{)732}$	$59\overline{)452}$	$67\overline{)427}$	$48\overline{)\$2.40}$	$91\overline{)545}$

Set 28

Show any remainder with R.

1.	$14\overline{)154}$	$32\overline{)2,644}$	$26\overline{)598}$	$51\overline{)2,402}$	$84\overline{)6,972}$
2.	$38\overline{)1,188}$	$23\overline{)966}$	$17\overline{)183}$	$87\overline{)6,365}$	$72\overline{)2,304}$
3.	$56\overline{)2,994}$	$79\overline{)4,898}$	$63\overline{)3,485}$	$45\overline{)1,530}$	$98\overline{)3,928}$
4.	$95\overline{)3,050}$	$60\overline{)5,620}$	$75\overline{)825}$	$36\overline{)414}$	$67\overline{)938}$
5.	$83\overline{)996}$	$54\overline{)542}$	$90\overline{)8,280}$	$16\overline{)176}$	$59\overline{)2,493}$
6.	$47\overline{)611}$	$28\overline{)560}$	$49\overline{)1,176}$	$76\overline{)4,064}$	$34\overline{)1,428}$

Set 29

Show any remainder with R.

1.	$24\overline{)\$23.80}$	$13\overline{)849}$	$21\overline{)1,887}$	$32\overline{)\$9.28}$	$47\overline{)3,797}$
2.	$17\overline{)714}$	$28\overline{)944}$	$43\overline{)3,346}$	$64\overline{)1,899}$	$18\overline{)446}$
3.	$36\overline{)2,078}$	$54\overline{)1,616}$	$39\overline{)975}$	$75\overline{)2,745}$	$82\overline{)6,478}$
4.	$45\overline{)4,183}$	$26\overline{)728}$	$62\overline{)3,600}$	$97\overline{)4,529}$	$19\overline{)798}$
5.	$56\overline{)5,406}$	$35\overline{)910}$	$87\overline{)4,209}$	$23\overline{)689}$	$92\overline{)8,274}$
6.	$29\overline{)696}$	$71\overline{)2,839}$	$66\overline{)5,896}$	$37\overline{)2,625}$	$68\overline{)6,106}$

Set 30

Show any remainder with R.

	a	b	c	d
1.	$13\overline{)3,969}$	$21\overline{)4,932}$	$36\overline{)10,809}$	$49\overline{)\$148.96}$
2.	$24\overline{)5,842}$	$17\overline{)9,758}$	$42\overline{)22,344}$	$57\overline{)6,059}$
3.	$35\overline{)\$15,400}$	$64\overline{)63,508}$	$95\overline{)35,055}$	$28\overline{)\$57.96}$
4.	$68\overline{)8,024}$	$53\overline{)24,857}$	$19\overline{)3,814}$	$47\overline{)18,181}$
5.	$74\overline{)36,844}$	$86\overline{)9,864}$	$75\overline{)\$154.50}$	$62\overline{)8,670}$
6.	$83\overline{)\$268.53}$	$79\overline{)8,119}$	$38\overline{)22,594}$	$92\overline{)9,660}$

Set 31

Show any remainder with R.

1.	$124\overline{)2,498}$	$316\overline{)10,925}$	$235\overline{)60,630}$	$403\overline{)\$963.17}$
2.	$542\overline{)490,960}$	$651\overline{)89,637}$	$179\overline{)\$603.23}$	$890\overline{)32,540}$
3.	$768\overline{)692,158}$	$982\overline{)9,926}$	$625\overline{)162,500}$	$358\overline{)\$85.92}$
4.	$963\overline{)\$1,194.12}$	$736\overline{)42,688}$	$195\overline{)1,860}$	$847\overline{)71,995}$
5.	$462\overline{)3,728}$	$578\overline{)120,926}$	$819\overline{)74,203}$	$282\overline{)106,914}$

Set 32

Copy, and write the missing numerators.

	a	b	c	d	e	f
1.	$\frac{1}{2} = \frac{?}{4}$	$\frac{3}{6} = \frac{?}{12}$	$\frac{8}{16} = \frac{?}{4}$	$\frac{1}{4} = \frac{?}{12}$	$\frac{3}{4} = \frac{?}{8}$	$\frac{1}{2} = \frac{?}{10}$
2.	$\frac{3}{4} = \frac{?}{12}$	$\frac{3}{5} = \frac{?}{10}$	$\frac{3}{4} = \frac{?}{16}$	$\frac{10}{16} = \frac{?}{8}$	$\frac{1}{2} = \frac{?}{6}$	$\frac{2}{3} = \frac{?}{12}$
3.	$\frac{2}{5} = \frac{?}{10}$	$\frac{4}{6} = \frac{?}{3}$	$\frac{4}{16} = \frac{?}{4}$	$\frac{1}{2} = \frac{?}{16}$	$\frac{1}{4} = \frac{?}{16}$	$\frac{1}{2} = \frac{?}{8}$

Set 33

Show side work and write each sum in the best form.

	a	b	c
1.	2 hr. 42 min. +1 hr. 35 min.	6 da. 15 hr. +2 da. 12 hr.	1 T. 1,200 lb. +2 T. 1,800 lb.
2.	3 pt. 1 c. 2 pt. 1 c. +1 pt. 1 c.	1 bu. 3 pk. 2 bu. 1 pk. + 3 pk.	3 qt. 1 pt. 1 qt. 1 pt. +1 qt. 1 pt.
3.	1 yd. 2 ft. 8 in. 2 ft. 10 in. +2 yd. 1 ft. 5 in.	2 gal. 3 qt. 1 pt. 1 gal. 2 qt. 1 pt. + 1 qt. 1 pt.	5 bu. 3 pk. 2 qt. 1 bu. 1 pk. 3 qt. +2 bu. 3 pk. 5 qt.

Set 34

Show side work for each example.

1.	6 yd. 1 ft. −2 yd. 2 ft.	10 min. − 3 min. 48 sec.	1 gal. 1 qt. − 3 qt.
2.	5 hr. 10 min. −2 hr. 40 min.	4 mi. 3,000 ft. − 4,000 ft.	8 lb. −3 lb. 9 oz.
3.	3 pk. 2 qt. −1 pk. 3 qt.	9 ft. −6 ft. 9 in.	7 qt. 1 pt. −2 qt. 1 pt.
4.	3 qt. 1 pt. 1 c. −1 qt. 1 pt. 1 c.	2 yd. 2 ft. 2 in. −1 yd. 2 ft. 8 in.	9 bu. 3 pk. 6 qt. −7 bu. 3 pk. 7 qt.

Set 35

1.	2 ft. = _?_ in.	1 qt. = _?_ pt.	2 pk. = _?_ qt.
2.	2 T. = _?_ lb.	5 gal. = _?_ qt.	2 hr. = _?_ sec.
3.	3 bu. = _?_ qt.	1 yd. = _?_ in.	2 gal. = _?_ pt.
4.	3 mi. = _?_ ft.	2 da. = _?_ hr.	3 lb. = _?_ oz.

		a	b
Set 36	1.	75 sec. = _?_ min. _?_ sec.	20 oz. = _?_ lb. _?_ oz.
	2.	17 pt. = _?_ qt. _?_ pt.	21 da. = _?_ wk. _?_ da.
	3.	3,000 lb. = _?_ T. _?_ lb.	18 pk. = _?_ bu. _?_ pk.
	4.	80 min. = _?_ hr. _?_ min.	2,800 lb. = _?_ T. _?_ lb.

		a	b	c
Set 37	1.	3 qt. 1 pt. ×5	2 ft. 5 in. ×3	4 hr. 25 min. ×4
	2.	1 yd. 2 ft. ×6	7 min. 10 sec. ×9	6 lb. 8 oz. ×7
	3.	1 mi. 700 ft. ×8	2 bu. 1 pk. ×7	1 ft. 4 in. ×6
	4.	3 yd. 2 ft. ×3	2 gal. 3 qt. ×2	4 pk. 5 qt. ×5

Set 38	1.	2)4 T. 600 lb.	5)3 lb. 2 oz.	2)1 mi. 200 ft.
	2.	5)13 ft. 4 in.	3)6 hr. 30 min.	8)1 ft. 4 in.
	3.	2)1 bu. 2 pk.	5)7 gal. 2 qt.	6)7 pk. 4 qt.
	4.	7)4 yd. 2 ft.	6)4 bu. 2 pk.	5)2 qt. 1 pt.
	5.	5)1 qt. 1 c.	2)5 da. 4 hr.	9)10 min. 21 sec.

Set 39

The first number is how many times the second? To find out, divide the first number by the second.

1. 4 ft. 2 in.; 5 in.
2. 2 hr. 20 min.; 1 hr.
3. 6 qt.; 2 qt. 1 pt.
4. 8 qt.; 1 gal. 2 qt.
5. 4,500 lb.; 1 T. 500 lb.
6. 1 bu. 1 pk.; 2 pk.

The first number is what part of the second? To find out, divide the first number by the second.

7. 1 ft. 9 in.; 27 in.
8. 1 hr. 20 min.; 2 hr.
9. 2 qt.; 3 qt. 1 pt.
10. 7 qt.; 8 gal. 3 qt.
11. 40 sec.; 4 min. 40 sec.
12. 1 yd. 2 ft.; 10 ft.

Set 40

	a	b
1.	54 in. = _?_ ft. _?_ in.	2 bu. 3 pk. = 1 bu. _?_ pk.
2.	3 lb. 5 oz. = _?_ oz.	1 yd. 4 ft. = 2 yd. _?_ ft.
3.	2 yd. 7 ft. = _?_ yd. 1 ft.	2 pk. 1 qt. = _?_ qt.
4.	1 qt. 1 pt. = _?_ pt.	4 yd. 3 ft. = 3 yd. _?_ ft.
5.	4 qt. 1 c. = _?_ c.	4 hr. 75 min. = _?_ hr. 15 min.
6.	2 bu. 3 pk. = _?_ bu.	200 sec. = _?_ min. _?_ sec.

Set 41

Reduce these fractions to lowest terms.

	a	b	c	d	e	f	g	h	i	j	k	l
1.	$\frac{2}{4}$	$\frac{3}{9}$	$\frac{2}{8}$	$\frac{5}{20}$	$\frac{16}{32}$	$\frac{4}{36}$	$\frac{4}{6}$	$\frac{7}{28}$	$\frac{4}{12}$	$\frac{16}{24}$	$\frac{4}{10}$	$\frac{6}{16}$
2.	$\frac{3}{24}$	$\frac{5}{30}$	$\frac{8}{32}$	$\frac{3}{6}$	$\frac{4}{8}$	$\frac{2}{12}$	$\frac{3}{15}$	$\frac{4}{16}$	$\frac{25}{40}$	$\frac{4}{32}$	$\frac{9}{36}$	$\frac{8}{10}$
3.	$\frac{6}{8}$	$\frac{15}{20}$	$\frac{24}{36}$	$\frac{3}{18}$	$\frac{4}{24}$	$\frac{8}{48}$	$\frac{6}{9}$	$\frac{6}{10}$	$\frac{9}{12}$	$\frac{6}{30}$	$\frac{8}{24}$	$\frac{6}{18}$
4.	$\frac{15}{40}$	$\frac{16}{48}$	$\frac{2}{10}$	$\frac{6}{12}$	$\frac{5}{15}$	$\frac{8}{12}$	$\frac{8}{16}$	$\frac{32}{48}$	$\frac{10}{15}$	$\frac{4}{20}$	$\frac{14}{16}$	$\frac{10}{30}$

Set 42

Change to whole numbers or to mixed numbers in best form.

	a	b	c	d	e	f	g	h	i	j	k	l
1.	$\frac{10}{2}$	$\frac{21}{9}$	$\frac{58}{8}$	$\frac{35}{16}$	$\frac{12}{5}$	$\frac{60}{24}$	$\frac{19}{6}$	$\frac{37}{8}$	$\frac{49}{5}$	$\frac{28}{12}$	$\frac{74}{10}$	$\frac{144}{48}$
2.	$\frac{32}{3}$	$\frac{52}{10}$	$\frac{30}{6}$	$\frac{72}{20}$	$\frac{18}{12}$	$\frac{73}{5}$	$\frac{45}{25}$	$\frac{83}{3}$	$\frac{35}{20}$	$\frac{96}{48}$	$\frac{35}{2}$	$\frac{63}{4}$
3.	$\frac{15}{4}$	$\frac{65}{2}$	$\frac{24}{18}$	$\frac{40}{36}$	$\frac{54}{3}$	$\frac{85}{8}$	$\frac{32}{24}$	$\frac{46}{12}$	$\frac{75}{16}$	$\frac{100}{25}$	$\frac{72}{9}$	$\frac{58}{16}$

Set 43

Add. Reduce answers to lowest terms.

	a	b	c
1.	$\frac{1}{2} + \frac{1}{2} + \frac{1}{2}$	$\frac{3}{8} + \frac{5}{8} + \frac{7}{8}$	$\frac{3}{10} + \frac{7}{10} + \frac{9}{10}$
2.	$\frac{3}{4} + \frac{1}{4} + \frac{3}{4}$	$\frac{5}{16} + \frac{3}{16} + \frac{11}{16}$	$\frac{2}{3} + \frac{2}{3} + \frac{1}{3}$
3.	$\frac{1}{12} + \frac{5}{12} + \frac{11}{12}$	$\frac{2}{9} + \frac{5}{9} + \frac{7}{9}$	$\frac{3}{20} + \frac{7}{20} + \frac{19}{20}$
4.	$\frac{7}{15} + \frac{9}{15} + \frac{2}{15}$	$\frac{5}{6} + \frac{5}{6} + \frac{1}{6}$	$\frac{2}{5} + \frac{1}{5} + \frac{4}{5}$
5.	$\frac{9}{32} + \frac{15}{32} + \frac{19}{32}$	$\frac{25}{48} + \frac{9}{48} + \frac{17}{48}$	$\frac{8}{25} + \frac{18}{25} + \frac{4}{25}$

Set 44

Subtract. Give all answers in best form.

	a	b	c	d	e
1.	$\frac{3}{8} - \frac{1}{8}$	$\frac{7}{10} - \frac{5}{10}$	$\frac{5}{6} - \frac{1}{6}$	$\frac{4}{5} - \frac{3}{5}$	$\frac{15}{16} - \frac{7}{16}$
2.	$\frac{7}{8} - \frac{5}{8}$	$\frac{19}{32} - \frac{15}{32}$	$\frac{7}{12} - \frac{1}{12}$	$\frac{39}{48} - \frac{27}{48}$	$\frac{7}{8} - \frac{3}{8}$
3.	$\frac{5}{16} - \frac{3}{16}$	$\frac{2}{3} - \frac{1}{3}$	$\frac{13}{20} - \frac{7}{20}$	$\frac{8}{15} - \frac{4}{15}$	$\frac{9}{10} - \frac{3}{10}$
4.	$\frac{5}{8} - \frac{3}{8}$	$\frac{7}{16} - \frac{3}{16}$	$\frac{3}{10} - \frac{1}{10}$	$\frac{11}{12} - \frac{5}{12}$	$\frac{13}{16} - \frac{3}{16}$

Set 45

Add. Reduce fractions in answers to lowest terms.

	a	b	c
1.	$3\frac{1}{2} + 2\frac{1}{2}$	$1\frac{1}{4} + 2\frac{3}{4} + 5\frac{1}{4}$	$6\frac{3}{8} + 3\frac{5}{8} + 2\frac{3}{8}$
2.	$1\frac{5}{16} + 2\frac{3}{16} + 5\frac{9}{16}$	$15\frac{3}{5} + 9\frac{1}{5} + 2\frac{4}{5}$	$3\frac{5}{6} + 1\frac{1}{6} + 9\frac{5}{6}$
3.	$5\frac{3}{10} + 8\frac{7}{10}$	$18\frac{2}{3} + 6\frac{2}{3}$	$2\frac{5}{32} + 8\frac{9}{32} + 4\frac{5}{32}$
4.	$4\frac{5}{12} + 3\frac{7}{12}$	$5\frac{3}{20} + 9\frac{13}{20}$	$7\frac{5}{24} + 2\frac{7}{24} + 1\frac{19}{24}$

Set 46

Subtract. Give fractions in answers in best form.

	a	b	c	d
1.	$4\frac{3}{8} - 3\frac{1}{8}$	$5\frac{5}{16} - 2\frac{3}{16}$	$14\frac{7}{8} - 6\frac{3}{8}$	$19\frac{1}{2} - 9\frac{1}{2}$
2.	$15\frac{7}{16} - 12\frac{5}{16}$	$10\frac{3}{5} - 5\frac{2}{5}$	$9\frac{1}{4} - 8\frac{3}{4}$	$7\frac{5}{8} - 7\frac{3}{8}$
3.	$6\frac{9}{32} - 3\frac{3}{32}$	$11\frac{5}{6} - 5\frac{1}{6}$	$6\frac{1}{2} - 6\frac{1}{2}$	$3\frac{7}{10} - 2\frac{3}{10}$
4.	$5\frac{3}{4} - 4\frac{1}{4}$	$9\frac{7}{12} - 7\frac{5}{12}$	$4\frac{9}{16} - 2\frac{5}{16}$	$8\frac{1}{3} - 6\frac{2}{3}$
5.	$9\frac{3}{10} - 6\frac{7}{10}$	$17\frac{7}{8} - 6\frac{1}{8}$	$25\frac{1}{3} - 13\frac{2}{3}$	$6\frac{9}{16} - 4\frac{3}{16}$

Set 47

Change to fractions with the denominator asked for.

	a	b
1.	$\frac{1}{2}, \frac{3}{4}$; to 4ths	$\frac{1}{2}, \frac{1}{4}, \frac{5}{8}$; to 8ths
2.	$\frac{1}{2}, \frac{1}{4}, \frac{7}{8}, \frac{5}{16}$; to 16ths	$\frac{1}{2}, \frac{5}{6}$; to 6ths
3.	$\frac{1}{2}, \frac{5}{6}, \frac{7}{12}$; to 12ths	$\frac{1}{2}, \frac{3}{5}$; to 10ths
4.	$\frac{1}{2}, \frac{1}{5}$; to 10ths	$\frac{1}{2}, \frac{4}{5}, \frac{3}{10}$; to 10ths

Change to fractions with the smallest common denominator.

	a	b	c	d
5.	$\frac{1}{2}, \frac{1}{4}$	$\frac{3}{4}, \frac{7}{8}$	$\frac{1}{2}, \frac{3}{10}$	$\frac{1}{8}, \frac{1}{2}$
6.	$\frac{3}{4}, \frac{5}{8}, \frac{1}{2}$	$\frac{2}{3}, \frac{1}{2}, \frac{1}{6}$	$\frac{1}{2}, \frac{11}{12}, \frac{1}{6}$	$\frac{7}{12}, \frac{5}{6}$
7.	$\frac{1}{2}, \frac{1}{5}, \frac{1}{10}$	$\frac{1}{16}, \frac{3}{32}, \frac{1}{4}$	$\frac{7}{10}, \frac{2}{5}$	$\frac{3}{8}, \frac{1}{2}, \frac{5}{16}$
8.	$\frac{3}{5}, \frac{7}{20}, \frac{1}{4}$	$\frac{5}{8}, \frac{3}{4}, \frac{3}{16}$	$\frac{9}{16}, \frac{7}{8}$	$\frac{9}{32}, \frac{7}{16}$

Set 48

Add. Give answers in best form.

	a	b	c	d	e
1.	$3\frac{1}{2} + \frac{1}{4}$	$\frac{3}{8} + 9\frac{1}{2}$	$4\frac{3}{10} + \frac{1}{5}$	$16\frac{1}{2} + \frac{1}{8}$	$\frac{9}{16} + 6\frac{3}{8}$
2.	$2\frac{1}{6} + \frac{1}{2}$	$8\frac{3}{10} + \frac{1}{2}$	$\frac{1}{2} + 6\frac{5}{12}$	$5\frac{3}{10} + \frac{1}{2}$	$2\frac{1}{2} + \frac{7}{16}$
3.	$\frac{3}{4} + 4\frac{1}{8}$	$\frac{5}{16} + 7\frac{1}{2}$	$9\frac{1}{4} + \frac{9}{16}$	$\frac{1}{12} + 11\frac{5}{6}$	$4\frac{3}{5} + \frac{3}{10}$
4.	$4\frac{1}{6} + \frac{7}{12}$	$12\frac{5}{8} + \frac{3}{16}$	$25\frac{1}{2} + \frac{1}{6}$	$4\frac{5}{8} + \frac{1}{4}$	$\frac{3}{4} + 1\frac{1}{16}$

Set 49

Subtract. Reduce fractions in answers to lowest terms.

	a	b	c	d	e
1.	$9\frac{1}{2} - \frac{1}{4}$	$5\frac{9}{16} - \frac{1}{2}$	$6\frac{1}{4} - \frac{1}{8}$	$12\frac{5}{6} - \frac{7}{12}$	$18\frac{1}{2} - \frac{1}{6}$
2.	$6\frac{5}{8} - \frac{1}{2}$	$3\frac{7}{12} - \frac{1}{6}$	$4\frac{5}{8} - \frac{5}{16}$	$5\frac{7}{10} - \frac{2}{5}$	$3\frac{9}{16} - \frac{1}{2}$
3.	$2\frac{3}{4} - \frac{5}{16}$	$1\frac{1}{2} - \frac{3}{10}$	$10\frac{1}{2} - \frac{5}{12}$	$14\frac{3}{4} - \frac{1}{2}$	$9\frac{7}{8} - \frac{1}{4}$
4.	$8\frac{7}{10} - \frac{1}{2}$	$10\frac{5}{6} - \frac{1}{2}$	$7\frac{4}{5} - \frac{3}{10}$	$7\frac{15}{16} - \frac{3}{4}$	$12\frac{13}{16} - \frac{3}{8}$

Set 50

Add. Give fractions in answers in best form.

	a	b	c
1.	$3\frac{1}{2} + 4\frac{1}{4} + 5\frac{1}{8}$	$7\frac{1}{5} + 16\frac{1}{2} + 9\frac{3}{10}$	$2\frac{5}{12} + 13\frac{5}{6} + 7\frac{1}{2}$
2.	$6\frac{3}{4} + 2\frac{1}{2} + 1\frac{3}{16}$	$15\frac{1}{6} + 8\frac{7}{12} + 5\frac{1}{2}$	$32\frac{1}{4} + 2\frac{9}{16} + 10\frac{1}{2}$
3.	$1\frac{1}{6} + 7\frac{5}{12} + 8\frac{1}{2}$	$20\frac{1}{2} + 6\frac{7}{8} + 4\frac{3}{4}$	$9\frac{1}{2} + 3\frac{7}{10} + 2\frac{4}{5}$
4.	$6\frac{1}{8} + 12\frac{1}{2} + 8\frac{3}{4}$	$2\frac{15}{16} + 18\frac{1}{4} + 3\frac{5}{8}$	$16\frac{3}{4} + 5\frac{7}{8} + 2\frac{7}{16}$
5.	$1\frac{1}{4} + 8\frac{3}{8} + 7\frac{5}{16}$	$8\frac{1}{4} + 5\frac{1}{2} + 10\frac{13}{16}$	$2\frac{1}{2} + 5\frac{1}{5} + 10\frac{1}{10}$

Set 51

Subtract. Give fractions in answers in lowest terms.

	a	b	c	d
1.	$6\frac{1}{2} - 3\frac{3}{4}$	$7\frac{3}{8} - 5\frac{1}{2}$	$10\frac{5}{16} - 9\frac{5}{8}$	$8\frac{3}{4} - 6\frac{15}{16}$
2.	$5\frac{1}{8} - 2\frac{3}{16}$	$4\frac{1}{6} - 3\frac{1}{2}$	$17\frac{1}{2} - 12\frac{5}{6}$	$10\frac{3}{10} - 9\frac{1}{2}$
3.	$15\frac{5}{6} - 9\frac{11}{12}$	$9\frac{3}{10} - 6\frac{4}{5}$	$6\frac{1}{8} - 3\frac{1}{4}$	$23\frac{3}{5} - 8\frac{7}{10}$
4.	$8\frac{3}{16} - 4\frac{1}{2}$	$16\frac{1}{2} - 6\frac{7}{12}$	$7\frac{1}{2} - 4\frac{7}{8}$	$9\frac{1}{2} - 4\frac{13}{16}$
5.	$10\frac{5}{12} - 7\frac{5}{6}$	$5\frac{3}{4} - 1\frac{7}{8}$	$22\frac{1}{4} - 12\frac{1}{2}$	$5\frac{3}{16} - 1\frac{3}{4}$
6.	$7\frac{1}{2} - 6\frac{9}{10}$	$8\frac{5}{12} - 2\frac{1}{2}$	$3\frac{3}{8} - 1\frac{3}{4}$	$11\frac{1}{8} - 10\frac{1}{2}$

Set 52

Add. Reduce fractions in answers to lowest terms.

	a	b	c
1.	$4\frac{1}{2} + 3\frac{2}{3}$	$12\frac{1}{5} + 16\frac{1}{2}$	$8\frac{2}{3} + 19\frac{3}{5} + 4\frac{7}{10}$
2.	$6\frac{1}{3} + 5\frac{3}{4}$	$4\frac{2}{3} + 2\frac{3}{8} + 1\frac{7}{12}$	$29\frac{2}{3} + 10\frac{4}{5}$
3.	$2\frac{1}{2} + 3\frac{1}{3} + 4\frac{1}{4}$	$18\frac{1}{3} + 10\frac{3}{10}$	$1\frac{3}{5} + 2\frac{1}{4} + 8\frac{9}{10}$
4.	$8\frac{2}{3} + 4\frac{7}{8}$	$3\frac{5}{9} + 1\frac{1}{3} + 2\frac{3}{4}$	$16\frac{2}{3} + 18\frac{3}{4} + 2\frac{5}{16}$
5.	$9\frac{1}{3} + 3\frac{2}{3} + 7\frac{3}{4}$	$14\frac{1}{4} + 8\frac{4}{5}$	$5\frac{1}{3} + 1\frac{5}{6} + 3\frac{2}{9}$
6.	$10\frac{4}{5} + 19\frac{5}{6}$	$12\frac{1}{2} + 2\frac{3}{5} + 5\frac{2}{3}$	$9\frac{1}{4} + 4\frac{1}{3} + 5\frac{1}{6}$

Set 53

Subtract. Give fractions in answers in best form.

	a	b	c	d
1.	$5\frac{1}{2} - 3\frac{2}{3}$	$9\frac{2}{5} - 3\frac{1}{2}$	$13\frac{1}{6} - 7\frac{1}{4}$	$8\frac{1}{6} - 7\frac{7}{9}$
2.	$16\frac{1}{3} - 12\frac{3}{4}$	$18\frac{1}{4} - 15\frac{1}{3}$	$7\frac{1}{2} - 5\frac{4}{5}$	$15\frac{2}{9} - 14\frac{3}{4}$
3.	$11\frac{3}{4} - 10\frac{4}{5}$	$6\frac{1}{6} - 1\frac{5}{9}$	$4\frac{1}{3} - 1\frac{3}{16}$	$10\frac{5}{8} - 9\frac{2}{3}$
4.	$9\frac{2}{3} - 6\frac{7}{8}$	$21\frac{3}{8} - 19\frac{7}{12}$	$16\frac{2}{9} - 10\frac{5}{6}$	$6\frac{1}{5} - 3\frac{1}{4}$
5.	$25\frac{3}{8} - 15\frac{2}{3}$	$12\frac{1}{3} - 8\frac{1}{2}$	$5\frac{1}{2} - 3\frac{3}{5}$	$9\frac{3}{4} - 5\frac{5}{6}$
6.	$8\frac{1}{5} - 4\frac{1}{3}$	$4\frac{3}{4} - 1\frac{8}{9}$	$9\frac{1}{4} - 4\frac{2}{3}$	$3\frac{1}{16} - 1\frac{1}{3}$
7.	$7\frac{1}{4} - 2\frac{5}{6}$	$14\frac{1}{3} - 12\frac{3}{5}$	$10\frac{2}{3} - 8\frac{4}{5}$	$3\frac{1}{12} - 1\frac{5}{8}$

Set 54

	a	b	c	d	e
1.	$4 \times \frac{1}{2}$	$10 \times \frac{2}{5}$	$1 \times \frac{1}{7}$	$3 \times \frac{8}{9}$	$11 \times \frac{3}{5}$
2.	$9 \times \frac{5}{3}$	$12 \times \frac{3}{8}$	$3 \times \frac{14}{5}$	$8 \times \frac{7}{8}$	$2 \times \frac{2}{7}$
3.	$5 \times \frac{1}{4}$	$8 \times \frac{7}{4}$	$16 \times \frac{5}{8}$	$7 \times \frac{4}{5}$	$15 \times \frac{3}{4}$
4.	$6 \times \frac{2}{3}$	$9 \times \frac{5}{6}$	$14 \times \frac{1}{9}$	$5 \times \frac{11}{8}$	$7 \times \frac{13}{2}$

Change these mixed numbers to improper fractions.

		a	b	c	d	e	f	g
Set 55	**1.**	$4\frac{1}{2}$	$5\frac{3}{4}$	$12\frac{1}{3}$	$9\frac{1}{4}$	$2\frac{5}{8}$	$11\frac{1}{10}$	$25\frac{1}{2}$
	2.	$2\frac{3}{16}$	$16\frac{2}{3}$	$3\frac{1}{7}$	$16\frac{1}{2}$	$8\frac{3}{10}$	$4\frac{5}{12}$	$32\frac{3}{8}$
	3.	$1\frac{1}{8}$	$6\frac{2}{5}$	$9\frac{7}{8}$	$7\frac{3}{32}$	$3\frac{3}{20}$	$10\frac{2}{3}$	$7\frac{5}{16}$
	4.	$9\frac{2}{3}$	$3\frac{7}{12}$	$1\frac{1}{6}$	$8\frac{7}{16}$	$15\frac{5}{6}$	$5\frac{3}{5}$	$30\frac{3}{4}$

		a	b	c	d	e
Set 56	**1.**	$6 \times 9\frac{7}{10}$	$9 \times 3\frac{1}{7}$	$7 \times 13\frac{2}{3}$	$6 \times 1\frac{7}{12}$	$8 \times 16\frac{1}{4}$
	2.	$4 \times 10\frac{3}{8}$	$3 \times 14\frac{3}{4}$	$2 \times 19\frac{5}{9}$	$4 \times 18\frac{3}{5}$	$6 \times 13\frac{4}{5}$
	3.	$2 \times 8\frac{5}{16}$	$4 \times 11\frac{5}{6}$	$8 \times 4\frac{7}{16}$	$5 \times 17\frac{7}{8}$	$2 \times 15\frac{1}{3}$
	4.	$3 \times 12\frac{1}{2}$	$9 \times 9\frac{2}{5}$	$5 \times 15\frac{5}{8}$	$7 \times 10\frac{6}{7}$	$5 \times 2\frac{7}{15}$

Set 57	**1.**	$\frac{1}{2} \times 19$	$\frac{2}{3} \times 8$	$\frac{8}{9} \times 5$	$\frac{4}{5} \times 30$	$\frac{5}{8} \times 18$
	2.	$\frac{3}{5} \times 20$	$\frac{1}{8} \times 12$	$\frac{5}{6} \times 32$	$\frac{1}{4} \times 13$	$\frac{1}{5} \times 16$
	3.	$\frac{1}{7} \times 15$	$\frac{3}{4} \times 14$	$\frac{1}{3} \times 25$	$\frac{5}{7} \times 9$	$\frac{3}{8} \times 22$
	4.	$\frac{7}{8} \times 6$	$\frac{2}{5} \times 10$	$\frac{3}{7} \times 35$	$\frac{1}{6} \times 52$	$\frac{5}{9} \times 4$

Set 58	**1.**	$\frac{2}{3} \times 18$	$\frac{3}{8} \times 30$	$\frac{2}{5} \times 16$	$\frac{1}{3} \times 231$	$\frac{8}{9} \times 45$
	2.	$\frac{1}{4} \times 136$	$\frac{4}{7} \times 35$	$\frac{5}{8} \times 24$	$\frac{4}{5} \times 12$	$\frac{5}{6} \times 128$
	3.	$\frac{7}{8} \times 14$	$\frac{3}{4} \times 120$	$\frac{3}{5} \times 19$	$\frac{5}{7} \times 21$	$\frac{1}{2} \times 315$

		a	b	c	d	e	f
Set 59	**1.**	$\frac{1}{3} \times \frac{3}{4}$	$\frac{5}{6} \times \frac{9}{15}$	$\frac{5}{16} \times \frac{1}{5}$	$\frac{7}{9} \times \frac{4}{7}$	$\frac{4}{5} \times \frac{7}{8}$	$\frac{1}{8} \times \frac{1}{2}$
	2.	$\frac{5}{9} \times \frac{3}{5}$	$\frac{1}{2} \times \frac{2}{5}$	$\frac{1}{7} \times \frac{5}{8}$	$\frac{7}{8} \times \frac{2}{5}$	$\frac{2}{3} \times \frac{7}{10}$	$\frac{5}{8} \times \frac{2}{15}$
	3.	$\frac{3}{16} \times \frac{2}{3}$	$\frac{5}{12} \times \frac{6}{7}$	$\frac{3}{4} \times \frac{2}{9}$	$\frac{4}{15} \times \frac{3}{8}$	$\frac{3}{5} \times \frac{5}{18}$	$\frac{3}{10} \times \frac{1}{9}$

		a	b	c	d	e	f
Set 60	**1.**	$\frac{2}{3} \times \frac{1}{2}$	$\frac{5}{12} \times \frac{3}{8}$	$\frac{3}{16} \times \frac{2}{15}$	$\frac{4}{7} \times \frac{7}{9}$	$\frac{11}{16} \times \frac{2}{3}$	$\frac{7}{8} \times \frac{5}{14}$
	2.	$\frac{7}{16} \times \frac{2}{7}$	$\frac{2}{5} \times \frac{3}{10}$	$\frac{7}{15} \times \frac{3}{4}$	$\frac{9}{16} \times \frac{5}{9}$	$\frac{1}{10} \times \frac{5}{16}$	$\frac{2}{15} \times \frac{3}{10}$
	3.	$\frac{7}{10} \times \frac{5}{6}$	$\frac{8}{15} \times \frac{5}{16}$	$\frac{3}{5} \times \frac{3}{10}$	$\frac{5}{6} \times \frac{7}{8}$	$\frac{3}{16} \times \frac{5}{12}$	$\frac{9}{10} \times \frac{3}{4}$

Set 61	**1.**	$\frac{1}{2} \times 2\frac{1}{3}$	$\frac{3}{8} \times 4\frac{8}{9}$	$\frac{2}{5} \times 7\frac{5}{9}$	$\frac{3}{4} \times 1\frac{3}{4}$	$\frac{5}{7} \times 4\frac{7}{8}$	$\frac{2}{3} \times 6\frac{1}{2}$
	2.	$\frac{3}{4} \times 1\frac{1}{5}$	$\frac{6}{7} \times 5\frac{1}{6}$	$\frac{1}{4} \times 8\frac{3}{4}$	$\frac{5}{8} \times 9\frac{1}{4}$	$\frac{3}{5} \times 5\frac{1}{2}$	$\frac{1}{9} \times 1\frac{4}{5}$
	3.	$\frac{2}{3} \times 3\frac{2}{3}$	$\frac{3}{5} \times 6\frac{5}{8}$	$\frac{7}{8} \times 3\frac{1}{7}$	$\frac{1}{5} \times 8\frac{5}{6}$	$\frac{4}{7} \times 4\frac{2}{3}$	$\frac{3}{8} \times 3\frac{1}{5}$

		a	b	c	d	e
Set 62	**1.**	$\frac{3}{5} \times 1\frac{2}{3}$	$\frac{1}{2} \times 2\frac{3}{16}$	$\frac{5}{12} \times 4\frac{1}{2}$	$\frac{3}{4} \times 9\frac{1}{7}$	$\frac{6}{7} \times 10\frac{3}{4}$
	2.	$\frac{1}{4} \times 12\frac{1}{4}$	$\frac{5}{6} \times 4\frac{4}{5}$	$\frac{7}{8} \times 5\frac{1}{7}$	$\frac{2}{9} \times 12\frac{3}{8}$	$\frac{1}{5} \times 11\frac{1}{2}$

		a	b	c	d	e	f	g	h
Set 63	**1.**	4 $\underline{\times 2\frac{1}{3}}$	6 $\underline{\times 3\frac{1}{8}}$	10 $\underline{\times 4\frac{2}{5}}$	5 $\underline{\times 9\frac{2}{3}}$	15 $\underline{\times 2\frac{5}{6}}$	9 $\underline{\times 7\frac{3}{8}}$	24 $\underline{\times 3\frac{7}{8}}$	3 $\underline{\times 8\frac{5}{9}}$
	2.	12 $\underline{\times 5\frac{1}{2}}$	7 $\underline{\times 1\frac{3}{5}}$	14 $\underline{\times 3\frac{1}{7}}$	16 $\underline{\times 6\frac{5}{8}}$	8 $\underline{\times 8\frac{3}{4}}$	19 $\underline{\times 1\frac{7}{9}}$	52 $\underline{\times 3\frac{1}{4}}$	2 $\underline{\times 9\frac{1}{6}}$

		a	b	c	d	e
Set 64	**1.**	$3\frac{1}{2} \times 5$	$1\frac{7}{8} \times 15$	$5\frac{2}{5} \times 18$	$7\frac{6}{7} \times 7$	$9\frac{3}{8} \times 15$
	2.	$2\frac{1}{8} \times 9$	$3\frac{1}{7} \times 17$	$8\frac{1}{3} \times 7$	$4\frac{7}{9} \times 27$	$8\frac{3}{4} \times 3$

Set 65	**1.**	$1\frac{1}{2} \times \frac{2}{3}$	$5\frac{5}{8} \times \frac{5}{9}$	$4\frac{1}{6} \times \frac{3}{5}$	$2\frac{1}{3} \times \frac{7}{8}$	$4\frac{3}{5} \times \frac{3}{4}$
	2.	$6\frac{2}{3} \times \frac{4}{5}$	$2\frac{5}{6} \times \frac{1}{3}$	$8\frac{1}{3} \times \frac{5}{7}$	$9\frac{1}{8} \times \frac{2}{5}$	$3\frac{7}{9} \times \frac{5}{6}$

Set 66	**1.**	$3\frac{1}{3} \times \frac{8}{9}$	$5\frac{5}{6} \times \frac{6}{7}$	$3\frac{3}{5} \times \frac{5}{16}$	$4\frac{1}{2} \times \frac{7}{8}$	$2\frac{5}{8} \times \frac{14}{3}$
	2.	$6\frac{2}{5} \times \frac{9}{16}$	$3\frac{1}{8} \times \frac{13}{5}$	$9\frac{3}{8} \times \frac{4}{15}$	$8\frac{4}{5} \times \frac{5}{16}$	$1\frac{1}{2} \times \frac{3}{4}$

Set 67

	a	b	c	d	e
1.	$2\frac{1}{3} \times 2\frac{1}{2}$	$8\frac{3}{4} \times 2\frac{3}{5}$	$5\frac{1}{4} \times 3\frac{2}{3}$	$1\frac{7}{8} \times 1\frac{2}{5}$	$4\frac{1}{4} \times 4\frac{1}{4}$
2.	$3\frac{1}{7} \times 1\frac{2}{9}$	$3\frac{1}{5} \times 2\frac{1}{4}$	$2\frac{6}{7} \times 1\frac{3}{4}$	$4\frac{1}{6} \times 7\frac{1}{2}$	$5\frac{1}{2} \times 2\frac{7}{8}$
3.	$6\frac{3}{8} \times 1\frac{5}{6}$	$9\frac{5}{9} \times 2\frac{5}{8}$	$3\frac{3}{5} \times 4\frac{3}{8}$	$2\frac{5}{8} \times 1\frac{1}{7}$	$6\frac{1}{3} \times 4\frac{1}{2}$

Set 68

Cancel if you can before you multiply.

	a	b	c	d	e	f
1.	$\frac{3}{4} \times \frac{1}{3}$	$\frac{1}{2} \times \frac{8}{9}$	$\frac{5}{8} \times \frac{7}{15}$	$\frac{2}{3} \times \frac{15}{16}$	$\frac{7}{8} \times \frac{4}{21}$	$\frac{3}{5} \times \frac{5}{12}$
2.	$\frac{5}{9} \times \frac{3}{10}$	$\frac{4}{5} \times \frac{7}{12}$	$\frac{3}{8} \times \frac{5}{12}$	$\frac{1}{7} \times \frac{7}{15}$	$\frac{2}{5} \times \frac{5}{8}$	$\frac{3}{8} \times \frac{4}{15}$
3.	$\frac{3}{5} \times \frac{5}{7}$	$\frac{5}{6} \times \frac{12}{25}$	$\frac{4}{5} \times \frac{13}{16}$	$\frac{7}{8} \times \frac{6}{7}$	$\frac{5}{6} \times \frac{4}{15}$	$\frac{1}{2} \times \frac{2}{3}$

Set 69

Cancel if you can before you multiply.

	a	b	c	d	e
1.	$9 \times \frac{2}{3}$	$3 \times 4\frac{1}{2}$	$\frac{3}{4} \times 15$	$\frac{5}{8} \times \frac{3}{10}$	$\frac{3}{7} \times 17\frac{1}{2}$
2.	$4\frac{1}{3} \times 19$	$2\frac{3}{8} \times \frac{2}{5}$	$1\frac{4}{5} \times 2\frac{2}{9}$	$8 \times \frac{3}{4}$	$4 \times 3\frac{5}{16}$
3.	$\frac{5}{6} \times 14$	$\frac{6}{7} \times \frac{14}{15}$	$\frac{7}{8} \times 18\frac{2}{3}$	$5\frac{4}{9} \times 12$	$4\frac{4}{5} \times 4\frac{1}{6}$
4.	$1\frac{4}{7} \times \frac{7}{11}$	$3\frac{3}{8} \times 1\frac{7}{9}$	$6 \times \frac{5}{12}$	$7 \times 1\frac{5}{14}$	$8\frac{1}{3} \times \frac{9}{10}$

Set 70

Cancel if you can before you multiply.

1.	$7 \times \frac{5}{14}$	$4 \times 12\frac{1}{2}$	$\frac{5}{7} \times 14$	$\frac{3}{8} \times \frac{7}{12}$	$\frac{4}{7} \times 16\frac{1}{3}$
2.	$3\frac{1}{8} \times 16$	$5\frac{3}{5} \times \frac{5}{7}$	$1\frac{3}{4} \times 3\frac{1}{7}$	$9 \times \frac{8}{15}$	$6 \times 9\frac{5}{8}$
3.	$\frac{3}{4} \times 18$	$\frac{7}{8} \times \frac{4}{15}$	$\frac{5}{9} \times 7\frac{1}{5}$	$4\frac{2}{3} \times 15$	$2\frac{5}{8} \times 5\frac{1}{3}$
4.	$5\frac{3}{7} \times \frac{14}{17}$	$4\frac{3}{8} \times 3\frac{1}{5}$	$8 \times \frac{7}{12}$	$5 \times 7\frac{9}{10}$	$3\frac{3}{4} \times \frac{8}{9}$

Set 71

Cancel if you can before multiplying.

	a	b	c
1.	$\frac{1}{2} \times \frac{2}{3} \times 2\frac{1}{4}$	$3\frac{1}{7} \times \frac{7}{8} \times \frac{3}{4}$	$18 \times \frac{2}{3} \times \frac{7}{8}$
2.	$\frac{1}{4} \times 2 \times 3\frac{1}{7} \times \frac{7}{8}$	$\frac{5}{6} \times 7\frac{1}{2} \times \frac{4}{5}$	$\frac{3}{8} \times \frac{2}{9} \times 3\frac{3}{5}$
3.	$16 \times \frac{5}{8} \times \frac{5}{6}$	$\frac{2}{5} \times \frac{3}{8} \times 2\frac{7}{9} \times 3\frac{3}{5}$	$\frac{1}{2} \times 2\frac{4}{7} \times \frac{3}{4} \times 1\frac{5}{9}$
4.	$8\frac{1}{3} \times 3\frac{1}{5} \times \frac{1}{2} \times \frac{3}{5}$	$9 \times \frac{2}{3} \times 12 \times \frac{7}{8}$	$10 \times 4\frac{4}{9} \times \frac{1}{6} \times \frac{3}{5}$

Set 72

Divide, using common denominators.

	a	b	c	d	e	f
1.	$12 \div \frac{1}{2}$	$8 \div \frac{3}{8}$	$10 \div \frac{2}{5}$	$6 \div \frac{4}{7}$	$20 \div \frac{2}{3}$	$19 \div \frac{1}{4}$
2.	$4 \div \frac{5}{8}$	$14 \div \frac{5}{6}$	$30 \div \frac{5}{7}$	$9 \div \frac{3}{5}$	$2 \div \frac{1}{6}$	$12 \div \frac{3}{4}$
3.	$16 \div \frac{4}{5}$	$25 \div \frac{7}{8}$	$15 \div \frac{5}{9}$	$11 \div \frac{3}{7}$	$18 \div \frac{2}{9}$	$13 \div \frac{2}{3}$

Set 73

Divide, using common denominators.

1.	$8 \div \frac{4}{5}$	$10 \div \frac{2}{3}$	$9 \div \frac{3}{8}$	$30 \div \frac{8}{9}$	$12 \div \frac{1}{6}$	$6 \div \frac{2}{7}$
2.	$7 \div \frac{5}{9}$	$6 \div \frac{7}{8}$	$20 \div \frac{5}{7}$	$8 \div \frac{5}{8}$	$2 \div \frac{7}{9}$	$4 \div \frac{5}{6}$

Set 74

Divide, using common denominators.

	a	b	c	d	e
1.	$6 \div 2\frac{1}{2}$	$2 \div 2\frac{2}{3}$	$3 \div 1\frac{1}{3}$	$10 \div 2\frac{5}{8}$	$4 \div 3\frac{3}{5}$
2.	$16 \div 9\frac{1}{3}$	$6 \div 6\frac{6}{7}$	$18 \div 1\frac{2}{3}$	$9 \div 6\frac{3}{4}$	$7 \div 9\frac{1}{3}$

Set 75

Divide, using common denominators.

1.	$8 \div 2\frac{2}{3}$	$10 \div 12\frac{1}{2}$	$9 \div 6\frac{3}{4}$	$7 \div 18\frac{2}{3}$	$12 \div 5\frac{1}{4}$
2.	$5 \div 10\frac{5}{8}$	$6 \div 13\frac{1}{3}$	$20 \div 5\frac{5}{7}$	$4 \div 14\frac{2}{7}$	$16 \div 7\frac{1}{5}$

Set 76

Divide by inverting the divisor and multiplying.

	a	b	c	d	e	f
1.	$\frac{5}{6} \div 5$	$\frac{7}{8} \div 2$	$\frac{3}{4} \div 6$	$\frac{1}{8} \div 2$	$\frac{2}{3} \div 8$	$\frac{1}{2} \div 5$
2.	$\frac{3}{5} \div 9$	$\frac{4}{5} \div 3$	$\frac{5}{7} \div 4$	$\frac{2}{9} \div 8$	$\frac{5}{6} \div 9$	$\frac{3}{5} \div 7$
3.	$\frac{1}{3} \div 3$	$\frac{4}{9} \div 6$	$\frac{2}{5} \div 2$	$\frac{6}{7} \div 3$	$\frac{1}{5} \div 2$	$\frac{5}{9} \div 5$

Set 77

Divide by inverting the divisor and multiplying.

1.	$\frac{7}{8} \div 7$	$\frac{3}{8} \div 9$	$\frac{3}{16} \div 6$	$\frac{5}{12} \div 2$	$\frac{1}{6} \div 3$	$\frac{7}{12} \div 2$
2.	$\frac{3}{10} \div 9$	$\frac{7}{9} \div 3$	$\frac{8}{9} \div 4$	$\frac{5}{8} \div 2$	$\frac{5}{16} \div 5$	$\frac{9}{10} \div 3$
3.	$\frac{2}{3} \div 4$	$\frac{3}{7} \div 6$	$\frac{7}{12} \div 3$	$\frac{1}{10} \div 3$	$\frac{8}{11} \div 4$	$\frac{1}{16} \div 2$

Set 78

Divide by inverting the divisor and multiplying.

	a	b	c	d	e
1.	$2\frac{1}{2} \div 2$	$4\frac{3}{8} \div 10$	$5\frac{1}{3} \div 8$	$6\frac{2}{5} \div 16$	$9\frac{3}{5} \div 3$
2.	$1\frac{2}{3} \div 5$	$9\frac{1}{3} \div 4$	$7\frac{1}{9} \div 16$	$8\frac{1}{4} \div 6$	$4\frac{7}{8} \div 9$
3.	$6\frac{1}{8} \div 7$	$7\frac{5}{7} \div 12$	$3\frac{3}{10} \div 9$	$2\frac{5}{8} \div 14$	$5\frac{5}{16} \div 2$

Set 79

Divide by inverting the divisor and multiplying.

1.	$8\frac{3}{4} \div 7$	$15\frac{3}{8} \div 4$	$6\frac{1}{2} \div 5$	$9\frac{4}{5} \div 7$	$14\frac{2}{5} \div 6$
2.	$16\frac{1}{4} \div 5$	$7\frac{5}{9} \div 2$	$10\frac{1}{8} \div 3$	$12\frac{1}{2} \div 8$	$6\frac{3}{7} \div 3$
3.	$7\frac{7}{8} \div 6$	$5\frac{5}{6} \div 5$	$8\frac{2}{3} \div 4$	$3\frac{1}{7} \div 2$	$4\frac{4}{9} \div 5$

Set 80

Divide by inverting the divisor and multiplying.

1.	$3\frac{3}{4} \div 6$	$1\frac{5}{9} \div 8$	$4\frac{1}{2} \div 12$	$2\frac{2}{7} \div 4$	$5\frac{5}{8} \div 18$
2.	$8\frac{1}{8} \div 15$	$3\frac{5}{6} \div 7$	$7\frac{7}{8} \div 9$	$6\frac{4}{5} \div 8$	$6\frac{2}{3} \div 10$
3.	$4\frac{2}{5} \div 8$	$7\frac{1}{2} \div 5$	$2\frac{2}{9} \div 4$	$1\frac{3}{7} \div 5$	$3\frac{1}{7} \div 6$

Set 81

Divide by using common denominators.

	a	b	c	d	e	f
1.	$\frac{3}{4} \div \frac{1}{4}$	$\frac{1}{3} \div \frac{2}{3}$	$\frac{5}{8} \div \frac{3}{8}$	$\frac{15}{16} \div \frac{5}{16}$	$\frac{6}{7} \div \frac{2}{7}$	$\frac{7}{8} \div \frac{5}{8}$
2.	$\frac{3}{8} \div \frac{7}{8}$	$\frac{3}{7} \div \frac{6}{7}$	$\frac{5}{12} \div \frac{7}{12}$	$\frac{2}{9} \div \frac{8}{9}$	$\frac{1}{6} \div \frac{5}{6}$	$\frac{11}{14} \div \frac{5}{14}$

Set 82

Divide by inverting the divisor and multiplying.

1.	$\frac{7}{8} \div \frac{5}{6}$	$\frac{3}{4} \div \frac{1}{2}$	$\frac{9}{16} \div \frac{1}{8}$	$\frac{5}{6} \div \frac{7}{12}$	$\frac{5}{8} \div \frac{3}{10}$	$\frac{1}{4} \div \frac{1}{6}$
2.	$\frac{7}{12} \div \frac{2}{9}$	$\frac{4}{5} \div \frac{2}{3}$	$\frac{5}{6} \div \frac{1}{4}$	$\frac{2}{3} \div \frac{3}{16}$	$\frac{8}{9} \div \frac{2}{3}$	$\frac{7}{16} \div \frac{3}{8}$

Set 83

Divide by inverting the divisor and multiplying.

1.	$\frac{1}{4} \div \frac{1}{2}$	$\frac{5}{8} \div \frac{5}{6}$	$\frac{3}{10} \div \frac{4}{5}$	$\frac{3}{4} \div \frac{7}{8}$	$\frac{1}{3} \div \frac{5}{7}$	$\frac{3}{5} \div \frac{9}{10}$
2.	$\frac{3}{8} \div \frac{3}{4}$	$\frac{1}{2} \div \frac{3}{4}$	$\frac{7}{12} \div \frac{7}{8}$	$\frac{2}{9} \div \frac{6}{7}$	$\frac{3}{10} \div \frac{4}{5}$	$\frac{2}{3} \div \frac{3}{4}$

Set 84

Divide by inverting the divisor and multiplying.

	a	b	c	d	e
1.	$\frac{1}{2} \div 2\frac{1}{2}$	$\frac{7}{8} \div 3\frac{3}{4}$	$\frac{2}{15} \div 6\frac{2}{5}$	$\frac{7}{10} \div 5\frac{3}{5}$	$\frac{5}{16} \div 1\frac{3}{5}$
2.	$\frac{3}{16} \div 2\frac{2}{3}$	$\frac{2}{3} \div 1\frac{5}{6}$	$\frac{3}{8} \div 1\frac{1}{4}$	$\frac{5}{6} \div 3\frac{1}{3}$	$\frac{1}{7} \div 5\frac{5}{7}$
3.	$\frac{5}{8} \div 8\frac{1}{3}$	$\frac{7}{12} \div 4\frac{2}{3}$	$\frac{3}{4} \div 4\frac{1}{2}$	$\frac{7}{9} \div 2\frac{2}{9}$	$\frac{4}{5} \div 4\frac{1}{2}$

Set 85

Divide by inverting the divisor and multiplying.

1.	$\frac{7}{8} \div 8\frac{3}{4}$	$\frac{3}{5} \div 2\frac{7}{10}$	$\frac{9}{16} \div 6\frac{3}{16}$	$\frac{1}{10} \div 1\frac{4}{5}$	$\frac{5}{6} \div 5\frac{5}{12}$
2.	$\frac{2}{3} \div 1\frac{4}{15}$	$\frac{5}{12} \div 3\frac{3}{4}$	$\frac{5}{18} \div 5\frac{5}{6}$	$\frac{4}{9} \div 7\frac{1}{5}$	$\frac{3}{8} \div 6\frac{1}{4}$
3.	$\frac{3}{16} \div 6\frac{3}{4}$	$\frac{3}{7} \div 2\frac{2}{5}$	$\frac{5}{8} \div 2\frac{13}{16}$	$\frac{1}{2} \div 1\frac{4}{5}$	$\frac{3}{4} \div 3\frac{3}{8}$

Set 86

Divide by inverting the divisor and multiplying.

1.	$2\frac{1}{2} \div 1\frac{1}{4}$	$4\frac{1}{2} \div 3\frac{3}{8}$	$5\frac{3}{7} \div 5\frac{3}{7}$	$1\frac{3}{4} \div 2\frac{4}{5}$	$2\frac{2}{9} \div 3\frac{1}{3}$
2.	$1\frac{7}{8} \div 3\frac{1}{3}$	$5\frac{5}{6} \div 1\frac{2}{3}$	$6\frac{1}{4} \div 7\frac{1}{2}$	$9\frac{3}{8} \div 4\frac{1}{6}$	$3\frac{1}{4} \div 1\frac{1}{2}$
3.	$1\frac{1}{2} \div 2\frac{1}{4}$	$1\frac{1}{8} \div 6\frac{3}{4}$	$2\frac{2}{3} \div 5\frac{1}{3}$	$1\frac{7}{8} \div 6\frac{1}{4}$	$3\frac{2}{3} \div 1\frac{4}{5}$

Set 87

Divide by inverting the divisor and multiplying.

1.	$2\frac{5}{8} \div 3\frac{1}{2}$	$10\frac{2}{3} \div 2\frac{2}{3}$	$1\frac{3}{4} \div 2\frac{1}{2}$	$13\frac{1}{2} \div 3\frac{3}{5}$	$1\frac{7}{15} \div 1\frac{2}{9}$
2.	$6\frac{3}{4} \div 10\frac{1}{2}$	$6\frac{7}{8} \div 11\frac{1}{4}$	$2\frac{1}{4} \div 5\frac{1}{4}$	$1\frac{7}{10} \div 1\frac{3}{5}$	$4\frac{1}{2} \div 7\frac{1}{2}$
3.	$11\frac{2}{3} \div 4\frac{3}{8}$	$4\frac{7}{12} \div 2\frac{3}{4}$	$3\frac{1}{8} \div 2\frac{3}{16}$	$16\frac{2}{3} \div 3\frac{1}{5}$	$5\frac{3}{5} \div 4\frac{4}{5}$

Set 88

Divide by the inversion method.

1.	$12 \div \frac{3}{5}$	$\frac{3}{8} \div 6$	$3\frac{1}{2} \div 7$	$\frac{1}{8} \div \frac{5}{8}$	$\frac{3}{5} \div \frac{7}{10}$
2.	$9\frac{1}{3} \div \frac{5}{6}$	$7\frac{1}{5} \div \frac{3}{5}$	$4\frac{1}{6} \div \frac{7}{8}$	$12 \div 5\frac{1}{3}$	$2 \div 10\frac{1}{2}$
3.	$\frac{7}{8} \div 2\frac{4}{5}$	$\frac{5}{6} \div 1\frac{1}{12}$	$7 \div \frac{4}{7}$	$\frac{3}{4} \div 12$	$8\frac{3}{4} \div 12\frac{1}{2}$
4.	$8\frac{1}{8} \div 2\frac{3}{5}$	$2\frac{7}{10} \div 3$	$4\frac{1}{2} \div 6\frac{3}{7}$	$9\frac{3}{5} \div 16$	$1\frac{5}{16} \div 2\frac{5}{8}$
5.	$16 \div \frac{3}{4}$	$\frac{1}{6} \div \frac{5}{6}$	$\frac{1}{2} \div 5$	$\frac{7}{16} \div \frac{7}{16}$	$\frac{7}{12} \div \frac{3}{5}$

Set 89

Divide, using inversion.

	a	b	c	d	e
1.	$\frac{3}{4} \div 6$	$8 \div \frac{2}{3}$	$4\frac{1}{2} \div 2\frac{1}{2}$	$\frac{5}{12} \div 2$	$15\frac{1}{2} \div \frac{2}{3}$
2.	$\frac{2}{7} \div \frac{4}{5}$	$\frac{3}{16} \div 9$	$9\frac{1}{3} \div \frac{5}{7}$	$5\frac{5}{16} \div \frac{5}{8}$	$\frac{7}{8} \div \frac{3}{16}$
3.	$7\frac{1}{2} \div 5$	$3\frac{1}{2} \div 10$	$\frac{5}{8} \div \frac{1}{2}$	$12\frac{1}{2} \div 4$	$6\frac{2}{3} \div \frac{7}{10}$
4.	$15 \div 1\frac{2}{5}$	$6 \div 6\frac{3}{8}$	$4\frac{3}{16} \div 5$	$\frac{3}{8} \div 1\frac{7}{8}$	$\frac{7}{16} \div 2\frac{1}{2}$
5.	$\frac{7}{8} \div 1\frac{5}{16}$	$1\frac{1}{8} \div 5\frac{1}{3}$	$9 \div 15\frac{3}{4}$	$13\frac{1}{3} \div 1\frac{1}{4}$	$2\frac{2}{9} \div 14\frac{2}{3}$

Set 90

Find the value of n.

	a	b	c
1.	$\frac{2}{3}$ of $15 = n$	$n \times 12 = 8$	$\frac{3}{4}$ of $n = 15$
2.	$32 \times n = 16$	$10 \times n = 6$	$n \times \frac{5}{6} = 20$
3.	$n \times \frac{1}{2} = \frac{1}{4}$	$\frac{3}{8}$ of $16 = n$	$9 \times n = 6$
4.	$6 \times n = \frac{3}{4}$	$5 \times n = \frac{1}{2}$	$n \times 4 = \frac{8}{9}$
5.	$\frac{3}{5}$ of $20 = n$	$n \times \frac{5}{6} = 10$	$3 \times \frac{2}{3} = n$
6.	$n \times \frac{7}{8} = \frac{5}{8}$	$\frac{3}{7}$ of $7 = n$	$\frac{5}{8}$ of $n = 20$

Set 91

Write these numbers with decimals.

	a	b	c	d	e	f	g	h
1.	$\frac{2}{10}$	$\frac{14}{100}$	$\frac{125}{1{,}000}$	$3\frac{7}{10}$	$10\frac{21}{1{,}000}$	$12\frac{9}{100}$	$4\frac{50}{100}$	$6\frac{7}{1{,}000}$

Write these numbers with common fractions.

2.	0.9	0.007	0.03	4.329	21.7	47.13	0.019	3.107

Write these numbers as common fractions in lowest terms.

3.	0.25	0.5	0.10	0.75	0.375	0.8	0.16	0.625
4.	0.05	0.15	0.6	0.50	0.2	0.120	0.35	0.48

Set 92

Add or subtract, as indicated.

	a	b	c	d	e	f	g	h
1.	2.5 +3.5	4.8 −2.7	3.6 −0.9	0.9 +1.4	50.4 −49.3	48.1 −29.6	24.0 +0.8	15.8 +3.9
2.	83.8 +0.4	0.9 +0.9	31.1 −1.7	72.5 +2.9	1.7 −0.8	0.3 +0.8	32.9 −32.9	45.0 −2.5

Set 93

Add or subtract, as indicated.

	a	b	c	d	e	f
1.	$2.25 +3.18	3.136 −0.215	4.78 +0.92	$6.50 +4.98	5.470 −2.087	$8.96 −0.97
2.	6.829 −0.758	$9.52 1.60 +0.37	7.009 −4.775	1.125 0.370 +8.625	$8.92 −7.98	5.106 0.093 +6.008

Set 94

1.	$6.75 ×12	3.468 ×23	202.9 ×20	2.5 ×25	$20.50 ×62	18.7 ×15
2.	1.602 ×75	$0.85 ×17	0.083 ×46	1.025 ×54	0.09 ×90	8.650 ×34

Set 95

	a	b	c	d	e
1.	6.3 ×10	$18.65 ×100	83.052 ×1,000	0.5 ×100	$7.38 ×10
2.	$98.75 ×1,000	0.625 ×100	2.6 ×1,000	1.921 ×10	$0.75 ×1,000
3.	0.07 ×10	6.982 ×1,000	9.5 ×100	1.804 ×100	0.8 ×1,000

		a	b	c	d	e	f
Set 96	1.	36 ×0.5	42 ×1.6	15 ×0.25	16 ×0.875	80 ×1.05	24 ×3.75
	2.	18 ×1.625	50 ×0.50	79 ×21.5	53 ×14.50	61 ×100.8	99 ×0.005

		a	b	c	d	e	f	g	h
Set 97	1.	$0.75 ×0.4	0.9 ×0.9	0.80 ×0.6	$0.18 ×0.5	0.5 ×0.8	$0.45 ×0.2	0.4 ×0.9	0.6 ×0.25
	2.	0.6 ×0.80	$0.20 ×0.5	0.4 ×0.07	$0.90 ×0.5	0.7 ×0.01	0.3 ×0.16	0.02 ×0.9	0.1 ×0.3

		a	b	c	d	e
Set 98	1.	3.6 ×1.4	$1.50 ×2.2	$50.75 ×3.4	4.5 ×10.6	$2.08 ×12.5
	2.	1.5 ×6.25	26.4 ×2.38	6.8 ×15.70	$18.25 ×4.8	$30.82 ×7.5

Set 99	1.	8.2 ×1.4	$17.25 ×8.6	201.2 ×5.9	$50.20 ×2.5	1.8 ×6.75
	2.	$1.96 ×3.8	41.5 ×4.42	$6.50 ×2.7	4.06 ×1.25	$3.48 ×6.5

		a	b	c	d	e	f
Set 100	1.	0.25 ×0.7	1.875 ×0.8	$0.25 ×0.25	2.605 ×0.12	$3.75 ×42	4.12 ×0.75
	2.	2.125 ×0.015	20.98 ×0.6	84 ×0.16	0.8 ×0.20	0.646 ×0.32	32.59 ×0.105

Set 101	a	b	c	d	e	f
1.	0.725 ×0.9	1.048 ×1.50	\$0.60 ×1.5	\$30.45 ×0.125	\$75.20 ×34	\$72.00 ×0.9
2.	12.875 ×0.102	10.375 ×0.20	86 ×0.9	5.208 ×0.375	90 ×0.65	0.255 ×0.16

Round to hundredths unless the quotient comes out even.

Set 102	a	b	c	d	e	f	g
1.	8)6	12)7	5)2	27)16	9)8	48)12	16)7
2.	35)10	84)21	4)3	25)17	7)1	41)8	60)33
3.	9)1	31)24	7)6	75)45	55)42	32)25	15)12

Change to 2-place decimals. Give any remainder in a fraction.

Set 103	a	b	c	d	e	f	g	h	i
1.	$\frac{3}{4}$	$\frac{5}{16}$	$\frac{2}{7}$	$\frac{16}{24}$	$\frac{7}{12}$	$\frac{1}{6}$	$\frac{5}{8}$	$\frac{9}{25}$	$\frac{5}{12}$
2.	$\frac{1}{9}$	$\frac{3}{8}$	$\frac{15}{16}$	$\frac{5}{7}$	$\frac{7}{24}$	$\frac{7}{16}$	$\frac{9}{21}$	$\frac{11}{12}$	$\frac{9}{16}$
3.	$\frac{7}{8}$	$\frac{6}{25}$	$\frac{1}{3}$	$\frac{5}{6}$	$\frac{8}{15}$	$\frac{1}{7}$	$\frac{2}{3}$	$\frac{7}{22}$	$\frac{13}{20}$

Set 104	a	b	c	d	e
1.	4)8.4	5)6.25	3)10.125	8)8.64	96)10.272
2.	6)0.96	23)0.46	7)13.86	48)1.104	9)95.985
3.	12)3.6	15)3.45	2)0.8	5)72.875	25)3.575
4.	9)9.117	6)0.876	66)72.6	35)42.35	16)0.032

Give each quotient to the nearest thousandth.

Set 105					
1.	6)6.728	5)9.1625	16)12.525	25)100.37	12)1.435
2.	7)123.125	15)816.50	8)25.7275	32)18.72	4)56.109
3.	3)2.755	24)6.982	20)22.42	9)0.3702	36)1.828

Set 106

	a	b	c	d
1.	$10\overline{)0.30}$	$100\overline{)1.05}$	$1{,}000\overline{)0.375}$	$10\overline{)4.2}$
2.	$100\overline{)93.6}$	$1{,}000\overline{)85.60}$	$10\overline{)5.75}$	$100\overline{)0.50}$

Set 107

	a	b	c	d	e
1.	$0.4\overline{)4.8}$	$0.6\overline{)7.32}$	$0.8\overline{)4}$	$0.5\overline{)12.75}$	$0.9\overline{)9.873}$
2.	$0.7\overline{)0.875}$	$0.2\overline{)32.4}$	$0.25\overline{)6.5}$	$0.12\overline{)0.396}$	$0.125\overline{)14}$
3.	$0.35\overline{)12.785}$	$0.114\overline{)142.5}$	$0.9\overline{)0.18}$	$0.32\overline{)739.2}$	$0.19\overline{)1.425}$

Set 108

If remainders continue, give quotients to the nearest hundredth.

1.	$0.9\overline{)3.785}$	$0.12\overline{)0.2}$	$0.7\overline{)0.098}$	$0.25\overline{)0.38}$	$0.007\overline{)0.7}$
2.	$0.06\overline{)2.585}$	$0.5\overline{)1.28}$	$0.15\overline{)168.5}$	$0.9\overline{)0.5625}$	$0.025\overline{)372}$

Set 109

Round uneven quotients to nearest thousandth.

1.	$1.5\overline{)7.5}$	$3.25\overline{)13}$	$6.2\overline{)0.806}$	$1.65\overline{)98}$	$12.5\overline{)8.75}$
2.	$2.04\overline{)3.672}$	$42.1\overline{)88.41}$	$1.14\overline{)131.1}$	$4.6\overline{)10.58}$	$7.75\overline{)786.2}$
3.	$18.5\overline{)401.45}$	$6.7\overline{)82.524}$	$5.5\overline{)77}$	$12.8\overline{)691.2}$	$1.38\overline{)34.5}$

Set 110

If necessary, round quotients to the nearest thousandth.

1.	$1.6\overline{)6.4}$	$37.5\overline{)88}$	$1.2\overline{)75.6}$	$6.7\overline{)128.25}$	$4.2\overline{)2.31}$
2.	$10.4\overline{)0.65}$	$1.5\overline{)1.86}$	$4.25\overline{)22.525}$	$8.2\overline{)9.75}$	$5.8\overline{)0.58}$

Set 111

Round any uneven quotient to the nearest hundredth.

	a	b	c	d
1.	$16\overline{)20}$	$5\overline{)8.695}$	$0.9\overline{)1{,}458}$	$1.5\overline{)69}$
2.	$0.35\overline{)8.645}$	$18\overline{)92.52}$	$24\overline{)564}$	$2.25\overline{)38.25}$
3.	$13.2\overline{)32.076}$	$0.264\overline{)46.2}$	$75\overline{)8{,}499}$	$29\overline{)75.806}$

Set 112

Round any uneven quotient to the nearest hundredth.

	a	b	c	d
1.	$15\overline{)72}$	$7\overline{)5}$	$9\overline{)0.875}$	$0.45\overline{)77}$
2.	$2.4\overline{)10}$	$7\overline{)9}$	$14\overline{)11}$	$16\overline{)1.7326}$
3.	$0.125\overline{)730.5}$	$1.32\overline{)9.375}$	$65\overline{)8{,}264}$	$25\overline{)8}$
4.	$6\overline{)642.25}$	$0.70\overline{)9.25}$	$10.5\overline{)212.75}$	$9\overline{)13}$
5.	$32\overline{)4}$	$83\overline{)12.98}$	$0.017\overline{)8.7}$	$3.40\overline{)0.375}$

Set 113

Work by short division. Show any remainder in a fraction.

	a	b	c	d	e	f	g
1.	$2\overline{)17}$	$8\overline{)71}$	$9\overline{)26}$	$8\overline{)66}$	$9\overline{)52}$	$5\overline{)39}$	$4\overline{)27}$
2.	$7\overline{)34}$	$6\overline{)45}$	$5\overline{)24}$	$9\overline{)80}$	$7\overline{)41}$	$4\overline{)34}$	$3\overline{)23}$
3.	$6\overline{)23}$	$7\overline{)62}$	$4\overline{)35}$	$3\overline{)17}$	$6\overline{)52}$	$3\overline{)29}$	$6\overline{)39}$
4.	$5\overline{)42}$	$2\overline{)19}$	$8\overline{)46}$	$2\overline{)13}$	$9\overline{)60}$	$8\overline{)59}$	$7\overline{)57}$

Set 114

Work by short division. Show any remainder in a fraction.

	a	b	c	d	e	f
1.	$3\overline{)86}$	$5\overline{)479}$	$7\overline{)464}$	$4\overline{)95}$	$6\overline{)194}$	$9\overline{)488}$
2.	$8\overline{)458}$	$2\overline{)43}$	$6\overline{)566}$	$5\overline{)121}$	$3\overline{)232}$	$6\overline{)298}$
3.	$7\overline{)687}$	$8\overline{)758}$	$9\overline{)298}$	$4\overline{)386}$	$9\overline{)785}$	$8\overline{)278}$
4.	$2\overline{)97}$	$3\overline{)254}$	$7\overline{)89}$	$4\overline{)346}$	$2\overline{)173}$	$5\overline{)439}$

Set 115

Work by short division. Round quotients to hundredths.

	a	b	c	d
1.	$3\overline{)\$20.00}$	$6\overline{)\$8.21}$	$0.4\overline{)6.7}$	$0.07\overline{)0.412}$
2.	$8\overline{)50.3}$	$0.8\overline{)\$6.11}$	$0.6\overline{)410}$	$0.03\overline{)0.5}$
3.	$0.3\overline{)0.710}$	$7\overline{)\$33.21}$	$0.09\overline{)2.501}$	$0.6\overline{)52}$
4.	$0.9\overline{)\$521}$	$9\overline{)23.3}$	$0.04\overline{)\$7.03}$	$0.7\overline{)402.2}$

Set 116

Work by short division and show any remainder with R.

	a	b	c	d	e	f
1.	$3\overline{)500}$	$4\overline{)510}$	$8\overline{)630}$	$9\overline{)350}$	$7\overline{)405}$	$8\overline{)311}$
2.	$6\overline{)221}$	$8\overline{)222}$	$7\overline{)912}$	$6\overline{)802}$	$4\overline{)110}$	$9\overline{)620}$
3.	$7\overline{)531}$	$4\overline{)310}$	$3\overline{)200}$	$9\overline{)422}$	$6\overline{)501}$	$3\overline{)410}$
4.	$9\overline{)242}$	$7\overline{)321}$	$6\overline{)532}$	$4\overline{)709}$	$3\overline{)740}$	$8\overline{)511}$

Set 117

	a	b	c	d	e	f	g	h
1.	$6\frac{1}{2} \times 8$	$2\frac{2}{3} \times 6$	$4\frac{3}{5} \times 7$	$7\frac{5}{8} \times 5$	$5\frac{1}{3} \times 4$	$9\frac{8}{9} \times 1$	$6\frac{4}{5} \times 7$	$2\frac{7}{8} \times 9$
2.	$3\frac{4}{7} \times 2$	$7\frac{2}{9} \times 4$	$3\frac{1}{7} \times 5$	$8\frac{3}{4} \times 2$	$2\frac{5}{6} \times 4$	$8\frac{1}{4} \times 9$	$5\frac{3}{8} \times 3$	$1\frac{1}{9} \times 3$

Set 118

	a	b	c	d	e	f
1.	$10\frac{1}{2} \times 2$	$4\frac{5}{6} \times 8$	$7\frac{5}{8} \times 7$	$8\frac{5}{14} \times 8$	$14\frac{7}{8} \times 4$	$2\frac{3}{11} \times 6$
2.	$6\frac{3}{10} \times 7$	$11\frac{4}{5} \times 9$	$13\frac{3}{5} \times 5$	$9\frac{11}{16} \times 2$	$18\frac{2}{5} \times 3$	$7\frac{5}{12} \times 5$
3.	$12\frac{2}{3} \times 4$	$3\frac{1}{7} \times 3$	$9\frac{3}{16} \times 6$	$12\frac{1}{9} \times 3$	$15\frac{3}{8} \times 2$	$5\frac{3}{4} \times 6$

Set 119

	a	b	c	d	e
1.	$2 \times 9\frac{1}{2}$	$5 \times 5\frac{2}{3}$	$7 \times 2\frac{4}{5}$	$9 \times 4\frac{3}{4}$	$2 \times 3\frac{7}{8}$
2.	$3 \times 8\frac{5}{6}$	$4 \times 6\frac{5}{8}$	$6 \times 1\frac{1}{8}$	$7 \times 3\frac{8}{9}$	$5 \times 7\frac{1}{5}$
3.	$6 \times 7\frac{3}{8}$	$2 \times 8\frac{2}{5}$	$5 \times 2\frac{5}{7}$	$3 \times 4\frac{3}{5}$	$1 \times 9\frac{5}{9}$
4.	$8 \times 3\frac{1}{7}$	$9 \times 1\frac{1}{3}$	$4 \times 5\frac{4}{9}$	$8 \times 6\frac{1}{4}$	$6 \times 4\frac{7}{8}$

Set 120

Divide, using the inversion method.

	a	b	c	d	e
1.	$8\frac{1}{2} \div \frac{3}{4}$	$2\frac{7}{10} \div \frac{3}{5}$	$12\frac{2}{3} \div \frac{2}{9}$	$7\frac{1}{5} \div \frac{3}{5}$	$3\frac{3}{4} \div \frac{5}{8}$
2.	$10\frac{1}{4} \div \frac{3}{8}$	$4\frac{1}{3} \div \frac{2}{3}$	$9\frac{3}{4} \div \frac{3}{4}$	$3\frac{5}{8} \div \frac{1}{4}$	$9\frac{1}{6} \div \frac{2}{3}$
3.	$6\frac{4}{9} \div \frac{5}{6}$	$6\frac{1}{10} \div \frac{2}{5}$	$5\frac{5}{12} \div \frac{5}{6}$	$11\frac{1}{5} \div \frac{2}{5}$	$5\frac{3}{5} \div \frac{4}{5}$

Set 121

Divide, using the inversion method.

	a	b	c	d	e
1.	$7\frac{1}{4} \div \frac{3}{4}$	$8\frac{3}{4} \div \frac{1}{8}$	$5\frac{1}{4} \div \frac{7}{8}$	$3\frac{3}{8} \div \frac{3}{5}$	$6\frac{1}{8} \div \frac{7}{12}$
2.	$2\frac{5}{8} \div \frac{6}{7}$	$6\frac{2}{3} \div \frac{5}{12}$	$8\frac{1}{2} \div \frac{3}{8}$	$1\frac{3}{7} \div \frac{5}{7}$	$2\frac{4}{5} \div \frac{7}{15}$
3.	$7\frac{1}{5} \div \frac{9}{10}$	$9\frac{3}{4} \div \frac{3}{10}$	$4\frac{2}{7} \div \frac{5}{6}$	$5\frac{2}{5} \div \frac{2}{15}$	$1\frac{7}{8} \div \frac{5}{6}$

Set 122

Round uneven quotients to the nearest tenth.

	a	b	c	d	e	f
1.	$12\overline{)75}$	$65\overline{)9{,}191}$	$8\overline{)38}$	$6\overline{)8{,}495}$	$15\overline{)486}$	$16\overline{)72}$
2.	$25\overline{)2{,}803}$	$4\overline{)174}$	$32\overline{)148}$	$8\overline{)57}$	$4\overline{)193}$	$6\overline{)81}$
3.	$16\overline{)54}$	$25\overline{)54}$	$15\overline{)3{,}375}$	$28\overline{)371}$	$24\overline{)5{,}205}$	$8\overline{)2{,}149}$

Set 123

Round quotients to the nearest thousandth unless the division ends sooner.

1.	$8\overline{)222}$	$45\overline{)882}$	$12\overline{)1{,}353}$	$18\overline{)42}$	$7\overline{)352}$	$8\overline{)563}$
2.	$22\overline{)179}$	$4\overline{)3{,}065}$	$34\overline{)3{,}822}$	$8\overline{)2{,}753}$	$18\overline{)28}$	$7\overline{)13}$
3.	$9\overline{)2{,}518}$	$8\overline{)13}$	$13\overline{)7{,}549}$	$32\overline{)408}$	$35\overline{)3{,}724}$	$24\overline{)114}$

Set 124

Round uneven quotients to the nearest hundredth.

	a	b	c	d
1.	$4\overline{)\$9.00}$	$\$0.05\overline{)\$50.00}$	$25\overline{)\$5.75}$	$15\overline{)\$50}$
2.	$\$0.10\overline{)\$0.65}$	$\$1.50\overline{)\$4.50}$	$\$0.04\overline{)\$16.50}$	$\$1.01\overline{)\$49.50}$
3.	$8\overline{)\$0.06}$	$\$3.25\overline{)\$8.00}$	$\$12.48\overline{)\$24.25}$	$12\overline{)\$50.96}$
4.	$0.60\overline{)\$30.00}$	$\$0.50\overline{)\$0.05}$	$\$36.00\overline{)\$0.90}$	$\$6.00\overline{)\$5.00}$

Set 125

Copy and write the equivalents.

1. 16 in. = _?_ ft.   6 tsp. = _?_ tbsp.   31½ in. = _?_ yd.
2. 800 lb. = _?_ T.   3 mo. = _?_ yr.   20 oz. = _?_ lb.
3. 3 pt. = _?_ gal.   75 sec. = _?_ min.   3,000 lb. = _?_ T.

Set 126

Change to

	a	**b**	**c**	**d**
1. ounces:	½ lb.	3 lb.	2½ lb.	7 lb. 5 oz.
2. feet:	24 in.	1½ yd.	½ mi.	2 rd.
3. minutes:	1½ hr.	30 sec.	1 da.	75 sec.
4. bushels:	16 qt.	3 pk.	10 qt.	6 pk.
5. quarts:	½ pk.	¼ bu.	3 pt.	2½ bu.

Set 127

Find the areas of rectangles with the following dimensions:

1. 3 ft. long; 2 ft. wide
2. Width, 2½ in.; length, 4 in.
3. Length, 1¼ yd.; width, ¾ yd.
4. Base, 2 mi.; height, 1 mi.
5. Each side, 8 in.
6. 8 ft. long; 3¼ ft. wide
7. 500 ft. by 150 ft.
8. 3 yd. long; 27 in. wide
9. 36 in. by 36 in.
10. ½ mi. long; 1,320 ft. wide
11. 6″ by 3½″
12. 4′ by 4′
13. 9 ft. by 12 ft.
14. 3″ × 5″
15. 8½″ × 11″
16. 9 in. by 13 in.
17. 7 yd. by ½ yd.
18. 20 mi. by 3½ mi.
19. 15″ by 15″
20. 4½ ft. by 6 in.

Tables of Measures

Liquid Measure

2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)

Dry Measure

2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)
2 gallons = 1 peck (pk.)
4 pecks = 1 bushel (bu.)

Cooking Measures

3 teaspoons (tsp.) = 1 tablespoon (tbsp.)
16 tablespoons = 1 cup (c.)
2½ cups = 1 pint (pt.)
5 cups = 1 quart (qt.)

Measures of Weight

16 ounces (oz.) = 1 pound (lb.)
100 pounds = 1 hundredweight (cwt.)
2,000 pounds = 1 ton (T.)

Measures in Counting

12 things = 1 dozen (doz.)
12 dozen = 1 gross
144 things = 1 gross

Measures of Time

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day (da.)
7 days = 1 week (wk.)
30 days = 1 month (mo.)
52 weeks = 1 year (yr.)
12 months = 1 year
365 days = 1 year
366 days = 1 leap year
10 years = 1 decade
100 years = 1 century

Measures of Length

12 inches (in.) = 1 foot (ft.)
3 feet (ft.) = 1 yard (yd.)
36 inches = 1 yard
5½ yards = 1 rod (rd.)
16½ feet = 1 rod
5,280 feet = 1 mile (mi.)
1,760 yards = 1 mile
320 rods = 1 mile

Measures of Surface, or Square Measure

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet (sq. ft.) = 1 square yard (sq. yd.)
30¼ square yards = 1 square rod (sq. rd.)
160 square rods = 1 acre (A.)
640 A. = 1 square mile (sq. mi.)

Index

Addition
  checking, 9, 20
  column, 9
  decimals, 220–222, 225, 226, 229, 230
  with denominate numbers, 78, 229
  estimating in, 21
  facts, 8, 291
  families, 8
  with fractions, 110–111, 112, 116–118, 119–121, 133, 144
  generalizations about, 7, 9, 23, 24, 70, 125
  likeness in, 7
  meanings, 7
  on a number line, 9, 14
  with mixed numbers, 112, 116–118, 119–121
  order in, 9
  relationship to: *multiplication*, 28, 131–133, 232; *subtraction*, 14
  of whole numbers, 7–11
  See also Practice, Problems, arithmetic applications in, *and* Tests
Area (rectangle, square), 84, 85, 86, 87
Average, 54–55, 56

Calendar, 90
Charts to show meanings in
  decimals, 217, 219, 223, 231, 237, 246, 261, 266
  division, 266, 278
  fractions and mixed numbers, 114, 122
  whole numbers, 1–3
  See also Diagrams, Number lines, *and* Tables
Checking, 9, 13, 19, 20, 30, 33, 39, 50, 52, 58, 59, 64, 221, 222, 242, 244, 258, 262, 263, 268, 285
Comparison(s)
  of decimals, 227
  by division (ratio), 182–185
  of fractions, 102–103
  by subtraction, 13

Decimal(s)
  addition with, 220–222, 225, 226, 229, 230
  comparing, 227
  division with, 255, 257–259, 262–264, 266–269, 271, 278, 287
  equivalents of common fractions, 231, 258, 259, 260–261, 287
  meanings in, 216–221, 223, 224, 237, 242–243, 246–247, 249, 266, 278
  multiplication with, 232–240, 242–245, 247, 249, 271
  on a number line, 228, 232, 242
  reading, 216–219, 223, 246
  reducing, 235
  repeating quotients, 259
  rounding, 228, 244–245, 248, 259, 263–265, 269, 278, 287
  rules (generalizations), 233, 234, 237, 239, 240, 243, 257, 267
  subtraction with, 220–222, 225–226, 229, 230
  writing, 218, 219, 223, 224
  See also Extra Practice, Practice, Problems, arithmetic applications, *and* Tests
Denominate numbers
  adding, 78, 84, 229
  changing to another unit, 76–77
  dividing, 81, 82, 84
  meanings of, 72–77
  multiplying, 80, 84
  subtracting, 79, 84, 229
  See also Extra Practice, Practice, *and* Problems, arithmetic applications
Denominator
  common, 114–115, 116–118, 119–121, 176–179
  defined, 98
Diagrams to show meaning in
  addition, 9
  area, 84–87, 242
  decimals, 224, 228, 231, 232, 242, 260
  division, 193–195
  fractions, 98, 99, 100, 102, 108, 110, 114, 122, 131–133, 134, 140, 141, 156, 175–177, 179, 193–195, 212, 224, 260
  measures, 97
  multiplication, 140, 242
  problem-solving, 55, 84–89, 108, 131, 134, 137, 140, 141, 195, 232, 242
  scale, 159, 160, 161
  subtraction, 13
  time, 88, 89, 90, 217
  whole numbers, 1
  See also Charts *and* Number line(s)
Divisibility, tests for, 279
Division
  with apparent quotient, 58–59, 62, 66
  checking, 50, 52, 58, 59, 64, 258, 263, 268, 285
  comparisons by (ratio), 182–185
  with decimals, 255, 257, 259, 262–264, 266–269, 271, 278, 287
  with denominate numbers, 81, 82
  divisibility, rules for, 279
  facts, 49, 50, 294
  with fractions, 175–180, 184, 185, 186, 187, 191, 193–195
  fractional-part, 47, 48

Division—*Continued*
  generalizations, 46, 47, 51, 55, 60, 61, 83, 178, 179, 184, 185, 187, 199, 205, 257, 267, 271, 285
  meaning of, 46–47
  measurement, 46, 48
  with mixed numbers, 196–199
  with non-apparent quotient, 60–66
  on a number line, 175–177, 193–194
  relationship to: *multiplication*, 49, 202–205, 271, 272–274; *subtraction*, 46, 50, 175
  remainder: *shown in a fraction*, 105; *shown in a decimal*, 270; *as a whole number* (*R*), 50, 52, 53, 64
  short method of, 284–287
  steps in, 52, 59, 64
  table numbers as help in, 50, 284–286
  with whole numbers, 46–53, 58–69, 255–256
  See also Extra Practice, Practice, Problems, arithmetic applications, *and* Tests
Drawing(s), scale, 159–161

Estimating
  in addition, 21, 70
  in A., S., M., D., 181
  in division, 61, 70
  generalizations about, 39, 122
  in measurement, 74–75
  with mixed numbers, 122
  in multiplication, 39, 70, 157, 158, 244–245, 247
  in problem-solving, 40, 70, 74–75, 125, 157, 158, 244, 264
  by rounding, 21, 39, 122, 244–245, 248
  in subtraction, 21, 70
Extra Practice
  addition facts, 291
  decimals: *adding*, 319; *changing to common fractions*, 318; *dividing*, 321–323, 325; *multiplying*, 319, 320, 321; *subtracting*, 319
  denominate numbers, 305–307, 326
  division facts, 294
  fractions and mixed numbers: *adding*, 308–311; *changing the form of*, 304, 307, 308, 309, 312, 318, 321; *dividing*, 315–318, 325; *multiplying*, 311–314, 324; *reducing*, 307, 308, 309, 312; *subtracting*, 308–311
  multiplication facts, 293
  subtraction facts, 292
  whole numbers (and money numbers): *adding*, 295, 296, 298, 299; *dividing*, 301–304, 321, 323, 324, 325; *multiplying*, 299–301; *subtracting*, 297, 298
  See also Practice *and* Tests

Factor, 28–29, 83, 172, 202–205, 240
Fractional unit, 99, 114, 229
Fraction(s)
  adding, 110–111, 112, 116–118, 119–121, 133, 144
  cancellation with, 150–152, 187–188, 194–197, 203
  common denominator of, 114–115, 119, 120–121, 176–179
  common-denominator method in dividing, 176, 177, 178, 179, 180, 193
  comparing, 102–103, 182–185 (ratio)
  decimal, *see* Decimal(s)
  decimal equivalents of, 231, 258, 259, 260–261, 287
  dividing with, 175–180, 185, 186, 187, 188–189
  equivalent, 102–103, 106–107, 114–115, 119, 120, 134, 178
  estimating with, 122, 157, 158, 181
  fractional unit of, 99, 114
  generalizations, 98, 99, 102, 104, 106, 107, 109, 110, 114, 116, 120, 122, 132, 135, 136, 140, 141, 142, 147, 150, 154, 155, 178, 179, 183, 185, 187, 199
  of a group, 101
  Golden Rule of, 106
  improper, 100, 108, 109, 134, 153, 287
  meanings in, 98–100, 102, 104, 105, 131, 138, 140–141, 144, 150, 175–177
  mixed-number equivalents of, 108, 109, 134–135, 287
  multiplying with, 131, 132, 135–143, 146–152, 154, 169
  on a number line, 100, 102, 110, 114, 122, 131–133, 175–177, 193–194
  of an object, 98–99, 131, 134, 140–141, 179, 195, 212
  proper, 100
  ratio as a, 182–185
  reducing, 106–109, 114, 119, 120, 134–135, 153, 287
  remainder in division in a, 105
  rounding, 122, 155, 158, 201, 207
  subtracting, 110–111, 113, 116, 118, 120–121
  See also Extra Practice, Mixed numbers, Practice, Problems, *and* Tests

Games, 144
Generalizations (rules) about
  adding, 7, 9, 23, 24, 70, 125
  cancellation, 150
  decimals, 233, 234, 237, 239, 240, 243, 257, 267
  division, 46, 47, 51, 55, 60, 61, 83, 178, 179, 184, 185, 187, 199, 203, 205, 267, 271, 285

Generalizations (rules) about—*Continued*
  estimating, 39, 122
  fractions and mixed numbers, 98, 99, 102, 104, 106, 107, 109, 110, 114, 116, 120, 122, 132, 135, 136, 140, 141, 142, 147, 150, 154, 155, 178, 179, 183, 185, 187, 199
  measures, 73, 76, 77, 85
  multiplication, 29, 30, 33, 39, 83, 132, 135, 136, 140, 141, 142, 147, 150, 154, 203,205,233,234,237,239,240,243,271
  numbers, 2, 73
  ratios, 183–185
  subtraction, 18, 23, 24, 70, 125
Graphs
  bar, 166–168, 208, 211
  line, 209, 211
  picture, 163, 164, 168
  table of data for, 163, 166–168, 208–211

Length, measurement of, 71–75, 84, 327

Map, reading a, 161
Meaning of
  addition, 7
  decimals, 216–221, 223, 224, 237, 242–243, 246, 249, 266, 278
  division, 48, 49
  fractions, 98–100, 102, 104, 105, 131, 138, 140–141, 144, 150, 175–177
  measures, 72, 73, 84, 85
  multiplication, 28, 29
  numbers, 1, 2, 3
  scale, 159–161
  subtraction, 13, 14, 15
Measure(s) and Measurement
  area, 84–87
  changing units of, 76–77
  cooking, 97
  vs. counting, 72–73
  decimals in, 229
  estimating, 73–75
  generalizations about, 73, 76, 77, 85
  linear, 71–75, 84, 327
  perimeter, 84
  reference units of, 73–75
  square, 84–87, 327
  tables of, 71, 86, 327
  of time, 88–91, 327
  of weight, 71–75, 327
  See also Denominate numbers, Practice, Problems, *and* Tests
Mixed number(s)
  adding, 112, 116–118, 120–121
  decimal, *see* Decimals
  dividing with, 179–180, 185, 188–189, 196–199
  estimating with, 122, 157, 158, 181
  fractions equivalent to, 108, 109, 134, 135, 287
  generalizations about, 109, 122, 135, 136, 142, 147, 179, 199
  meanings in, 100
  multiplying with, 135–137, 142, 146–148, 154–155, 169
  on a number line, 100, 133
  rounding, 122, 155, 158, 207
  subtracting, 113, 116–117, 118, 121
  See also Decimals *and* Fractions
Multiplication
  checking, 30, 33, 39, 135, 148, 233, 243
  with decimals, 232–235, 237–240, 242–245, 247, 248, 249
  with denominate numbers, 80, 84–87
  estimating in, 39, 157, 158
  factor(s): *defined*, 28; *finding missing*, 83, 202–206, 271, 280; *reversing*, 29, 35, 148, 240
  facts, 29, 293
  with fractions, 131, 132, 133, 135–143, 146–152, 154, 169
  generalizations about, 29, 30, 33, 39, 83, 132, 135, 136, 140–142, 147, 150, 154, 203, 205, 233, 234, 237, 239, 240, 243
  meaning of, 28–29
  with mixed numbers, 135–137, 142, 146–148, 154–155, 169
  order of factor, in, 28–29, 35, 148, 240
  on a number line, 131–133
  relationship(s) to: *addition*, 28, 131–133, 232; *division*, 49, 202–205, 272–274
  with whole numbers, 28–39
  zero in, 33, 36–37, 237, 243
  See also Extra Practice, Practice, Problems, arithmetic applications *and* Tests

n to represent missing numbers, 23, 83, 139, 152, 155, 172, 202, 203–206, 232, 271, 280
Number line(s) to show meanings in
  addition, 9, 14
  decimals, 228, 232, 242
  division, 175–177, 193, 194
  fractions and mixed numbers, 100, 102, 110, 114, 122, 131–133, 175–177, 193, 194
  multiplication, 131–133, 232, 242
  subtraction, 13, 14
  time, 91
  whole numbers, 6, 9, 13, 14, 91
Numbers and the number system, 1–6, 217–219, 223, 224
  generalizations about, 2, 73
  rounding, 4, 122, 211, 228
Numerator, 98
  generalizations about, 132, 141, 155, 178

Perimeter, 84
Practice
  The style of type for page numbers indicates the kind of work, as follows: Heavy (**000**), oral; italic (*000*), written; light (000), both oral and written.
  The abbreviations A., S., M., and D., are used for the words "addition," "subtraction," "multiplication," and "division."
  decimals: *A., 221, 225, 226,* 229; *comparing, 227; D.,* **258,** *259, 262, 263,* **266,** *268, 269, 270, 275, 278, 280, 287; and equivalent fractions, 231,* **258,** *259,* **260,** *261, 265; M., 232, 233, 234, 235, 237, 238, 239, 240, 243, 244, 245, 247,* **248,** *249; M., D.,* **280;** *reading and writing,* **217,** *218, 219,* **223,** *224, 231,* **246–247;** *review,* **248, 274,** *275–277; rounding,* **228, 248;** *S., 221, 225, 226, 227, 229*
  denominate numbers: *A., 78; A., S.,* 229; *A., S., M., D., 84, 283; changing unit of, 76, 77; D., 81, 82; M., 80, 85, 86; S., 79*
  extra, *295–326*
  fractions: *A., 112, 119,* **120;** *A., S., 111,* **116,** *117, 118, 121, 153; A., S., M., D., 192; cancellation with,* 150, *151, 152; common denominator of, 115,* 119, **120;** *and equivalent decimals, 231,* **258,** *259,* **260,** *261, 265, 287; D.,* 178, *179,* **185,** *187, 189, 191,* **193,** *194, 195, 196, 197, 199; M., 132, 135,* **138,** *139, 141, 142, 147, 148,* 150, *151, 152,* 155, *156; M., D.,* 203, *206; as ratios,* **182,** *183,* **184, 185;** *reducing, 106, 107, 109,* **134,** *135, 153; rounding,* **122,** *207; S., 111, 113, 117, 118, 121, 153*
  measures, *see* denominate numbers
  mixed numbers: *A., 112, 117, 118; D., 179,* **185,** 189, *196, 197, 199; M., 135, 136, 142, 147, 148, 151, 152,* 155, *156; M., D.,* **202,** 203; *reducing, 106, 107, 109,* **134,** *135, 153; rounding,* **122, 155,** *207; S., 113,* **116,** *117, 118*
  review, cumulative, *153, 164, 165, 171, 172,* 181, *191,* 192, **201,** *207,* **212,** 241, *250, 265,* **275**
  whole numbers: *A., 8, 9, 11; A., S., 21, 22, 23; A., S., M., D., 63, 94, 115, 145, 153, 171,* 181, *190,* 192; *D., 50, 51,* 52, *53, 58, 59, 60, 61, 62, 65, 66, 67,* **68,** *69, 105,* **184, 266,** *279,* **284,** *285,* **286,** *287; M., 30, 31, 33, 34, 35,* **36,** *37, 38,* 39; *M., D., 83; reading and writing,* 1, 2, 3, *6; Roman, 5; rounding,* 4; *S., 15, 17,* **18,** *19*
  See also Extra practice *and* Tests
Problems, arithmetic applications in, See note under topic *Practice*
  average, **54–55,** *56*
  decimals: *A., S., 222,* 225, *230; D., 255, 264,* 277; *M., 236,* **245,** 248; *M., D.,* **271,** 272–274
  fractions: *A., M., 133, 165; A., S., 111, 117,* **121,** *123; D.,* 175, *180, 187, 189,* 190, *195, 198; M., 137,* **140, 141,** 143, *149, 151,* **157,** 158; *M., D.,* 200–201, **204–205,** 206
  graphs, 163, *164,* **166,** *167*
  mixed numbers: *A., M., 165; D., 180, 189, 198; M., 137,* 143, *149, 151,* **157,** 158; *M., D.,* 200–201
  measures, **73, 74–75,** 84–85, 86, *87,* 88, 89, 90, 91, *92, 145,* **159,** *160, 161*
  whole numbers: *A., S.,* 24–25, 26; *A., S., M.,* 40; *A., S., M., D., 63,* 70, 124–125, 126; *D.,* 48, *56,* 69; *M., D.,* **204–205,** 206
Problems, social applications in
  animals, 133, *160,* 200–201
  bills and shopping, 25, *151,* **157,** 158
  camping, *16,* **194,** 195
  cooking and diet, *123, 189, 230*
  conservation, 163
  earning money, *32*
  factory work, *32*
  farms and gardens, *10,* **140,** *180,* **205**
  fishing, 182–183
  hobbies, *27, 45*
  model automobiles, *27*
  museum, visiting, 24
  natural history, 24, *160*
  parties and picnics, *57, 222*
  pets, *133,* 200–201, **204**
  roadbuilding, **262–263**
  school, *12,* 40, *57*
  science, 24, *160*
  soda fountain, 175
  sports, *12,* **205,** *211*
  stamp collections, *45*
  telephones, **210**
  trains, railroad, *236*
Problem-solving, helps in
  See note under topic *Practice*
  analyzing the situation, 48, 124–125, 143
  data: *missing,* 126, **281;** *in related problems, 236, 255; unnecessary,* 126
  diagrams, **55, 84, 85, 86,** *87,* 131–133, **134,** *137,* 140, 141, **159,** *160, 161,* 175, **179,** *180,* **194,** 195, **242**
  differentiating between processes: *A. and M.,* 133; *A. and S.,* 24, 25, 26, *117,* **121,** *123, 222; A., S., and M.,* 40; *A., S., M., and D., 63,* 70, 125; *M. and D.,* 200–201, **204–205,** 206, **271,** 274

Problem-solving, helps in—*Continued*
  errors, finding, **121**, **133**
  estimating and rounding, **24**, **40**, **70**, **74–75**, **122**, **125**, **157**, 158, **245**, *264*
  making problems, *15*, *63*, *113*, *198*, *282*
  meaning of process, 7, **13**, **28–29**, **46–47**
  question: *hidden* (2-step problem), 25, 26, **54–55**, 69; *stating, with numbers*, 248, **274**, **277**; *stating, in words*, **124**; *supplying*, *282*

Ratio, 182–185
Rectangle(s), 84–87
Relationships between: *addition and multiplication*, 28, 131–133, 232; *division and multiplication*, 49, 202–205, 271, 272–274; *division and subtraction*, 46, 50, 175; *numbers shown in a fraction* (*ratio*), 182–185; *multiplier and product*, 154; *multiplicand and product*, 155; *see also* Comparisons
Roman numerals, 5
Round numbers and rounding
  data for graphs, 210, 211
  decimals, 228, 244, 245, 248, 259, 263–265, 269, 278, 287
  in estimating, 21, 39, 122, 244, 245, 248
  fractions, 122, 155, 201, 207
  generalizations about, 39
  meanings, 4
  mixed numbers, 122, 155, 158, 207

Scale(s)
  in diagrams, 159, 160
  in graphs, 163, 166, 167
  in maps, 161
Scale drawing(s), 159–161
Square, area of a, 84, 85, 86, 87
Square measure, 84–87, 327
Subtraction
  borrowing in, 17–19
  checking, 13, 19, 20
  comparison by, 13
  of decimals, 220–222, 225–226, 229, 230
  of denominate numbers, 79, 84, 229
  difference in, 13
  facts, 14, 292
  families, 15
  of fractions, 110–111, 113, 116–118
  generalizations about, 18, 23, 24, 70, 125
  higher-decade, 15
  meanings in, 13, 14
  of mixed numbers, 113, 116–118, 121–122
  on a number line, 13, 14
  relationships to: *addition*, 14; *division*, 46, 50, 175
  See also Extra practice, Practice, Problems, arithmetic applications, *and* Tests
Supplementary work, *see* Extra practice

Tables
  of data: *decimals*, 231, 261, 278; *fractions*, 199, 231, 261; *for graphs*, 163, 166, 167, 168, 208–211; *reading*, 1, 2, 3, 4, 5, 71, 86, 89, 97, 146, 162, 163, 166, 167, 210–211; *whole numbers*, 4, 6
  to show number relations, 4, 6, 231, 261
  of measure: *counting*, 327; *dry*, 71, 327; *length*, 71, 327; *liquid*, 71, 327; *square*, 86, 327; *time*, 71, 89, 327; *weight*, 71, 327
  See also Charts
Tally marks, 162
Tests
  choosing correct answer, 153, 283
  computation, 43, 94, 129, 172, 215, 253, 290
  diagnostic, 42, 93, 128, 171, 215, 253, 290
  information and meaning, 41, 92–93, 127, 170, 214, 251, 288
  inventory, 7, 10, 12, 16, 27, 32, 45, 57, 71, 97
  measures, 71, 97
  problem-solving, 42–43, 95, 128–129, 173, 213, 252, 289
  See also Extra practice, Practice, *and* Review
Time, 88–91

Unit(s)
  fractional, 99, 114, 226–227, 229, 234–235
  of measure: *linear*, 71–75; *reference*, 73–75; *square*, 84–87; *time*, 88–91

Weight, measuring, 71, 75, 327

Zero
  in addition, 8
  in work with decimals, 217, 235, 237, 257–259, 269
  in division, 49, 53, 105, 256, 257, 258, 259, 269
  in multiplication, 29, 30, 34, 36–37, 39, 237, 243
  on a number line, 9, 13, 14, 91, 100, 102, 110
  in subtraction, 14, 19

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